DOUGLAS'S

ENCYCLOPÆDIA.

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A Book of Reference for Bacon Curers, Bacon Factory Managers, Bacon Agents, Meat Purveyors, Meat Inspectors, Meat Salesmen, Abattoir Superintendents, City, County, or Local Authority Officers, Cold Store Proprietors and Managers, Sausage and Pork Pie Makers, and all other industries associated with the Meat, Pork, Provision, and General Food Trades.

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PREFACE.

The great success of the "Manual of the Pork Trade" and "Douglas's Receipt Book," written by our Mr LOUDON M. DOUGLAS, has shown that the Meat, Pork, Provision, and General Food Trades appreciate technical information given in a concise and accurate form. It has been a reproach brought against the people of the United Kingdom, that while technical books were produced in large numbers in Germany and America they were not required or appreciated in this country. Our experience leads us to say that this is an entirely mistaken impression; the Traders and Manufacturers of this country appreciate good technical literature when it is offered to them. It is therefore with entire confidence in the result that we offer a much more ambitious work to the Food Trades' public than either the "Manual" or the "Receipt Book."

This Encyclopædia has involved enormous labour, which, however, has been lightened by the willing co-operation of many friends both at home and abroad. For the valuable help these friends have given us we tender our sincere thanks.

So far as we can judge this book is likely to come into the hands of many people in many countries and, as in a work of this kind there are sure to be some errors, we will take it kindly if our readers will send us a note of anything of that character they may observe. We shall at all times be pleased to discuss with readers any of the subjects treated of in the ***Encyclopœdia,*** and will always welcome fresh suggestions and corrections for use in subsequeut editions.

WILLIAM DOUGLAS & SONS LTD.

BALTIC WHARF,
PUTNEY,
LONDON, S.W.

Abattoirs or Slaughter-houses.—The abattoirs in the United Kingdom are for the most part conceived on very primitive lines. Beyond issuing a pamphlet containing "Model Bye-laws" for the regulation of slaughter-houses, the government as represented by the Local Government Board have done very little in the way of making the construction of abattoirs a national necessity. At the present time (1901) the question stands thus:—In many towns the local authority propose, or have proposed, to erect abattoirs for the use of the butchers and with the object of forcing them to slaughter all animals there. The butchers on the other hand cling to their private slaughter-houses and refuse to discuss the matter except on the basis of compensation for invested rights.

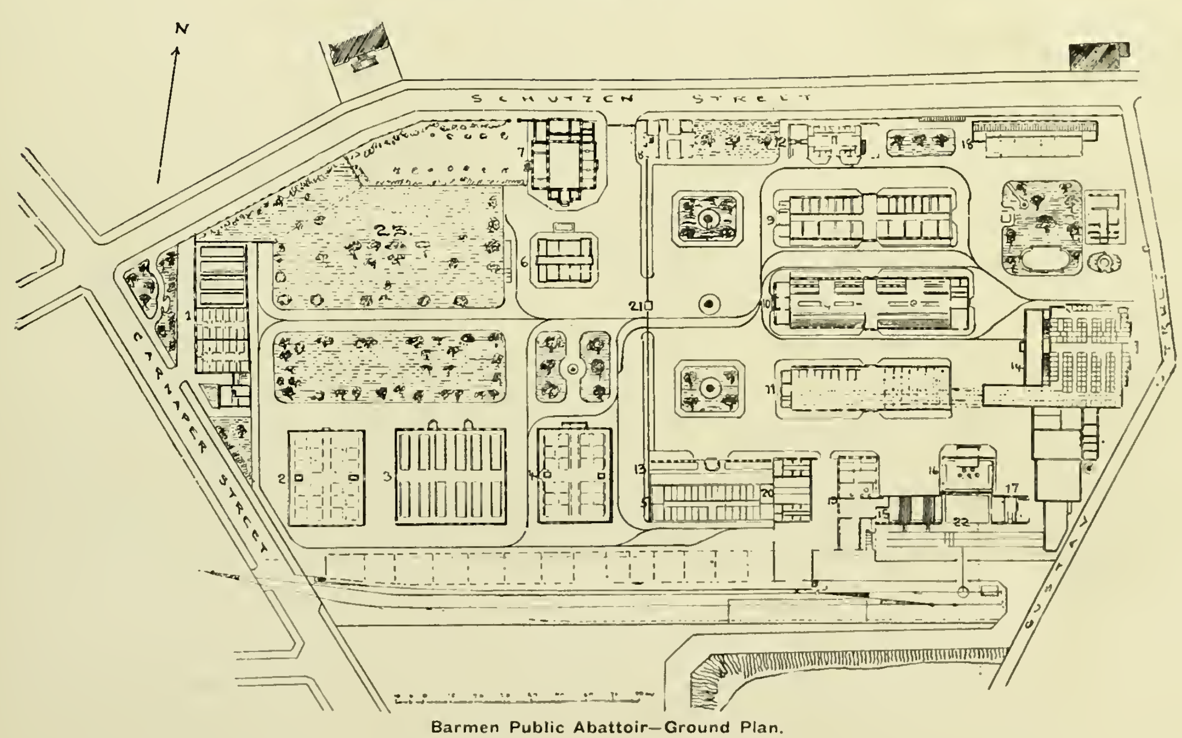
We do not propose to enter into the arguments for or against public *versus* private abattoirs. The object of this Encyclopædia is to place facts before our readers from which they can draw their own conclusions. Public abattoirs from the point of view of the engineer are of very great interest as they abound in the most ingenious machinery and appliances. This is especially the case on the Continent, where even second-rate towns have spent very large amounts on abattoirs. Germany has the most elaborate system and the compulsory use of these is established by law.

Whether the same state of matters will obtain in the United Kingdom can only be answered by time, but, judging from the many applications which have been made to the local government board for loans with which to construct abattoirs, it is evident that the principal cities and towns recognise that abattoirs are amongst the first rank of municipal institutions. Whether those holding licenses for slaughter-houses at present should be compensated or not is a question with which we have nothing to do. Doubtless the meat traders will take good care of themselves.

The *Construction* of an abattoir is comparatively easy. It is desired first of all to obtain perfect hygienic conditions and second, convenience in the working.

Perhaps the best specimens of properly constructed abattoirs are to be seen in Germany. Take for example Barmen This is a handsomely got up place and a short description of it will really embody the features of any modernly built place.

PUBLIC ABATTOIR — BARMEN



Barmen Public Abattoir—Ground Plan.

The departments include:—

1. House for Podewils apparatus.
2. Cooling House.
3. Machinery Room and Boiler House.
4. Stalls for all the various animals (these cover a very wide area).
5. Bacteriological House.
6. Restaurant for the people engaged in the Slaughter-house.

See *Abattoirs and Cattle-yards* from the German of Dr SCHWARZ, in which a very full account of the German system is given.—William Douglas & Sons Limited, Putney, London.

The main buildings are three, and are composed of:—

Slaughter-house for large animals.

Slaughter-house for swine.

Slaughter-house for smaller animals.

Situated all round about these main buildings are auxiliary departments.

The *Slaughter-house for Large Animals* is constructed on the most generous scale and the fittings are very elaborate. Wall hoists of double acting and self locking design are spaced round the walls and these are used for working wire ropes attached to the meat trees.

Barmen General Abattoir.
Slaughter-house for large Animals.

There is a complete system of overhead tracking by which the carcases can be carried to any part of the slaughter-house or to the cooling house.

The weighing of the cattle is accomplished by means of an overhead scale which renders the process very easy indeed.

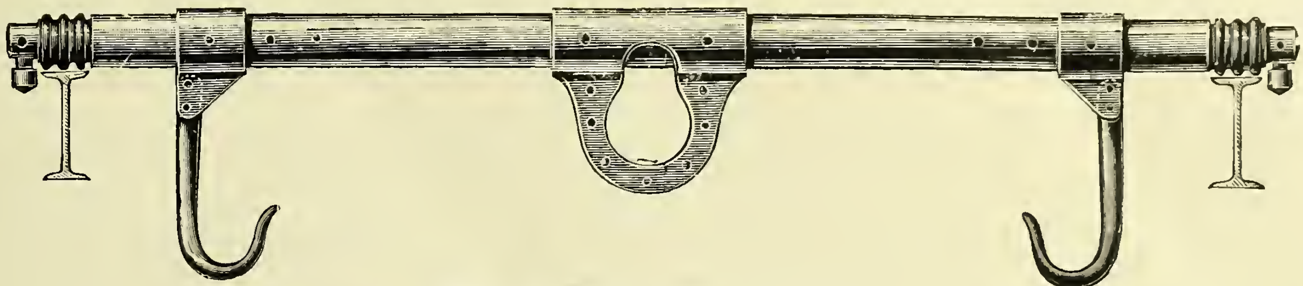
When the carcases are cooled they are passed into the cooling house which is just one large hall divided into cubicles which are rented to the various butchers. These cubicles are constructed of heavy wire netting and are charged at so much per square metre of space.

No private slaughter houses are permitted within the neighbourhood of Barmen, and all animals are by law subject to inspection in this abattoir. In connection with it there is a market where live stock may be brought for sale, and there is a line of railway running alongside, so that there is no leading or driving of animals through the town. The abattoir and market are situated on the borders of the town, in an open situation where they are not surrounded by other property.

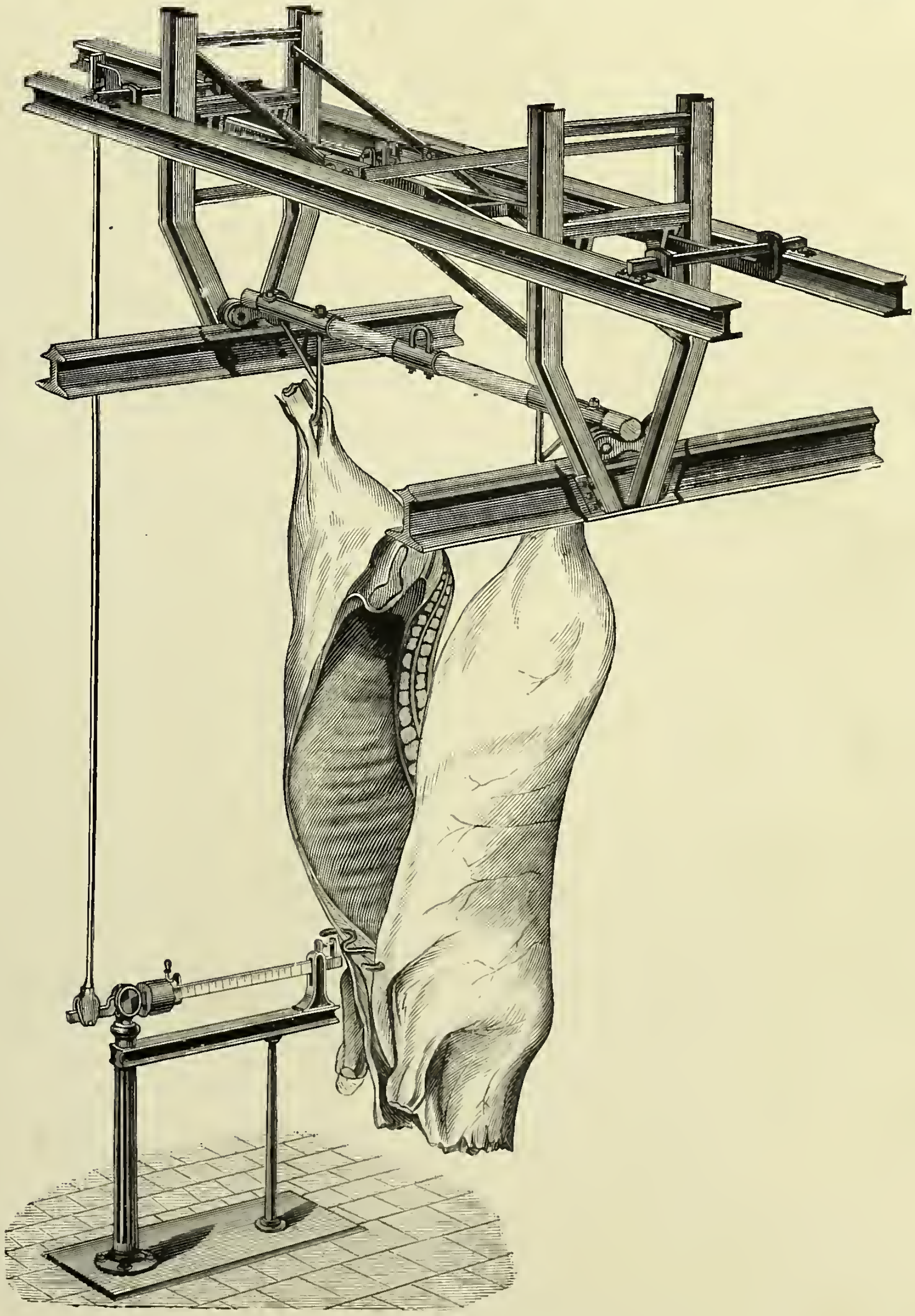
The *Slaughter-house for Swine* is constructed on totally different principles from those adopted in the United Kingdom. The pigs are first of all stunned by means of Koch's stupefying apparatus and bled on the floor. This is contrary to the best practice.

Recently the Dublin Corporation put up a model pig abattoir and as will be seen by the illustration it is designed for use in a different way to the German method.

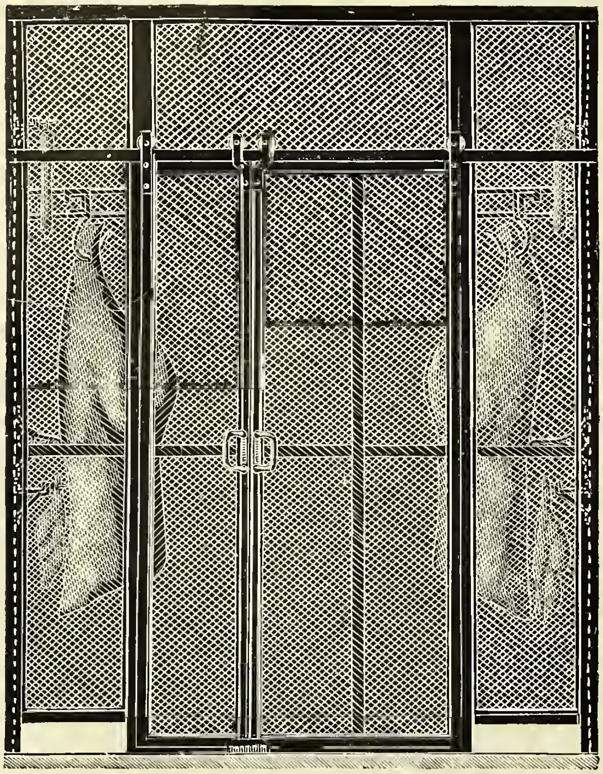
In the German method, after the pigs are bled they are carried to a circular scalding tank, and by means of cranes



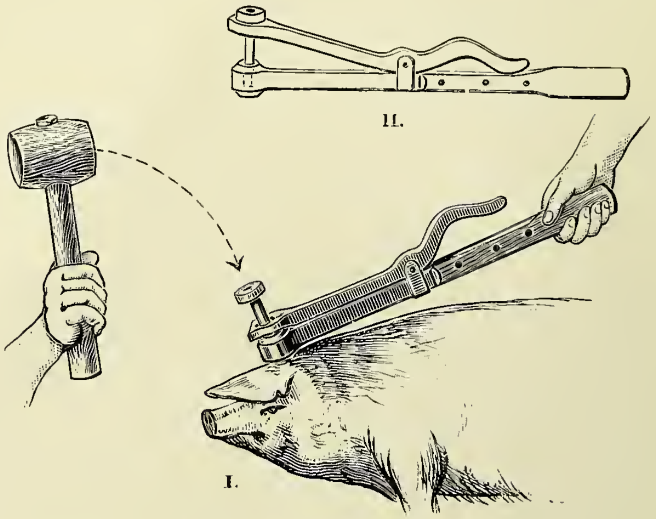
Design of German Meat Tree, used in Abattoirs.



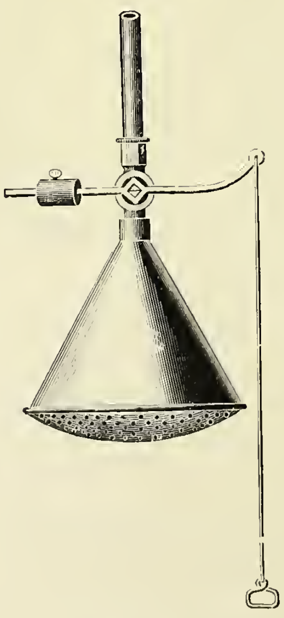
Cattle Weighing Scale in use in German Abattoirs



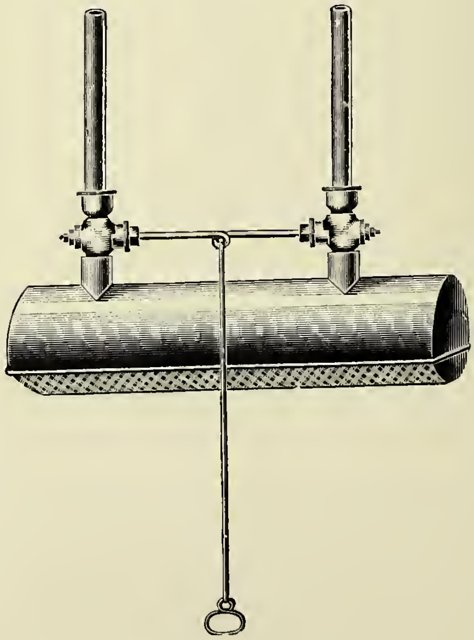
Cooling House Cubicle.



Director Koch's Pig Killing Apparatus.



Single Sprinkler.



Double Sprinkler.

lowered into this and removed from it when properly scalded, on to the scuttling table.

The British method is to raise the pigs to an overhead track bar and slaughter them when hanging in the verticle position. When they are dead they are pushed along the track bar into the scalding tank, where they are turned round until quite scalded, and are then removed by the "cradle" from the tank and which simply tilts them on to the scuttling table, where they are scraped.

The subsequent operations are practically alike except that in the German abattoirs specimens are taken from every pig slaughtered and inspected microscopically to see if any trichinae are present.

The *Slaughter-house for Smaller Animals* is pretty much the same as the slaughter-house for swine, with the difference that there is no scalding apparatus but an elaborate complement of benches for slaughtering sheep, etc.

Two of the auxilliary departments are especially interesting viz —the department in which the Podewils apparatus is worked (see "Podewils Apparatus") and the Bacteriological House.

The examination for trichinae and other dangerous germs of disease forms a feature in all continental abattoirs which might be copied with advantage elsewhere.

The specimens from the carcases are taken by authorized inspectors and the microscopical examination is generally conducted by trained females.

Pig slaughtering as practiced in the United Kingdom is carried out by the aid of the newer forms of apparatus. This apparatus consists of (1) mechanical hoists, (2) overhead track bars, (3) dumping table, (4) scalding tank, and (5) scuttling table. This combination of apparatus is commonly called "the slaughtering tack."

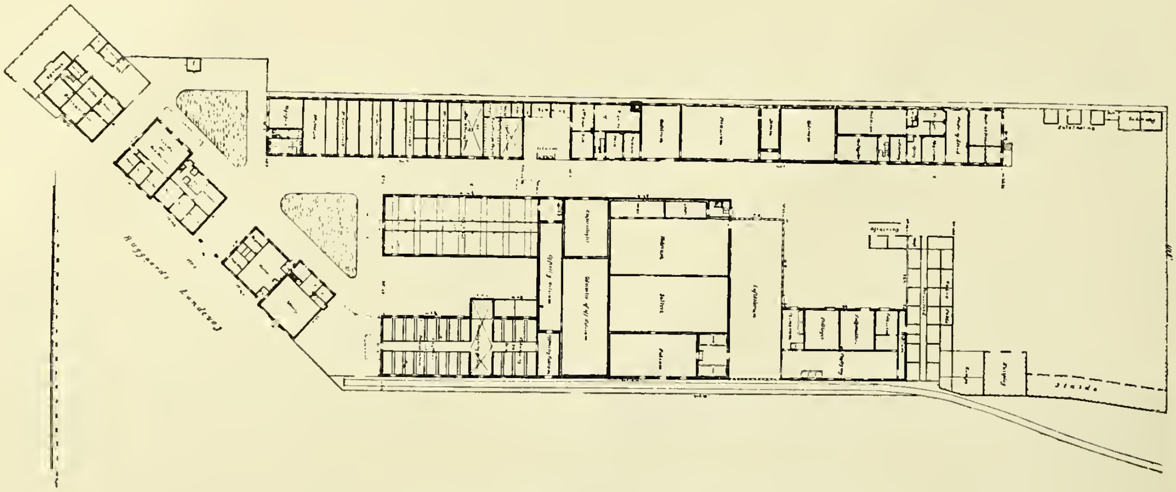
Hoists. – The wall hoist is now most commonly used for hoisting pigs for slaughter. It is compact and out of the way and being as a rule driven with one to three spur wheels its power is considerable, and one man can easily raise a load of 5 cwts. They should be fitted with good brakes and a steel wire rope galvanised is preferable to a chain.

Overhead Track Bars.—These are usually made of $1\frac{3}{4}$ in. round bar iron fastened to overhead girders by hangers so arranged that a double headed travelling hook can be pushed from end to end of the system without being lifted off. By means of switches parallel lines of bars can be joined to one another, or a number of lines can be joined to one bar running across them, so that pigs on hooks from any of the lines can be run on to the cross line without being lifted off. The whole bar system of the abattoir is thus connected together, and a pig can travel from end to end and back again, or to any part of it without being lifted off the bars.

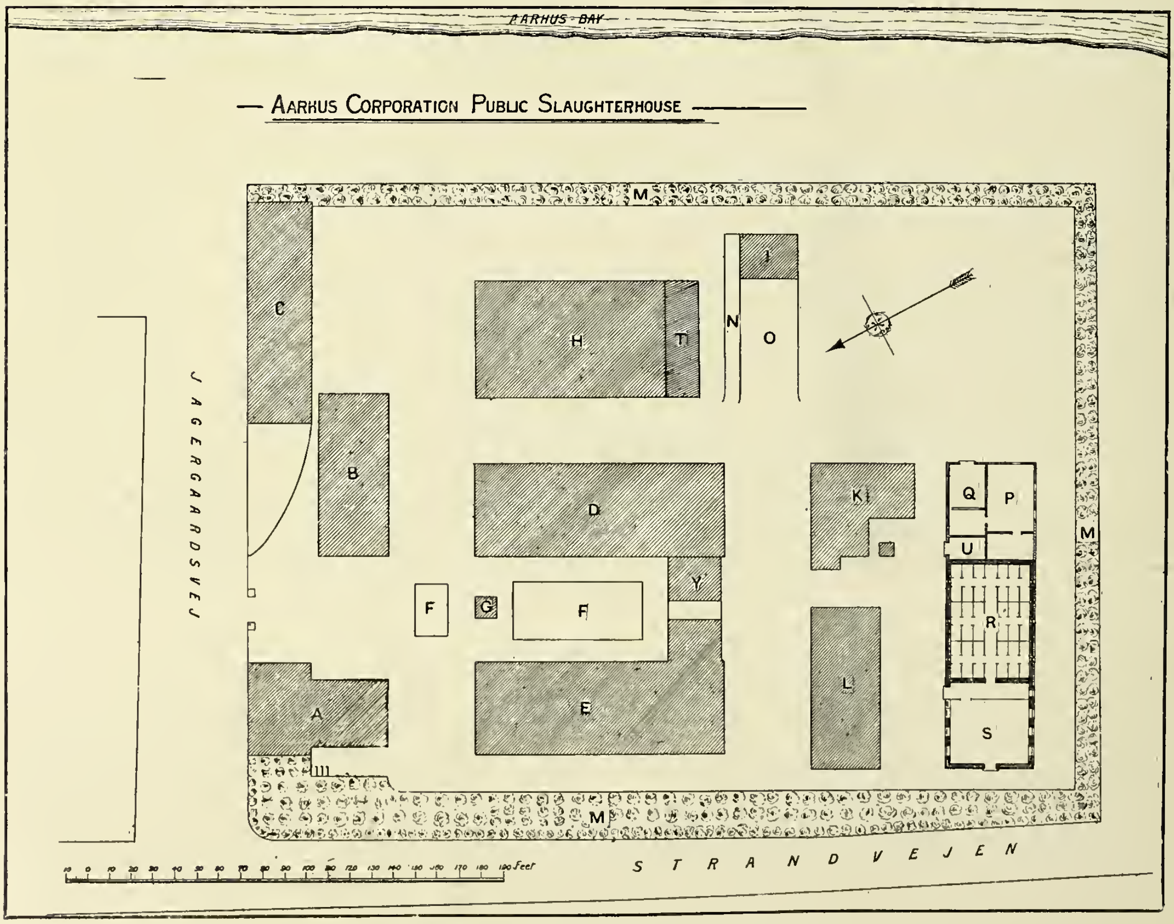
Barmen Abattoir—Pig Section.

Dumping Table.—A stopping table which receives the carcase of the pig off the bar from the killing passage. From this table the carcase is rolled into the scalding tank.

Scalding Tank consists of a rectangular tank of boiler plate at the one end of which is a "cradle" worked by a long lever for throwing out the scalded pigs on to the scuttling table. It is usually kept heated by steam.

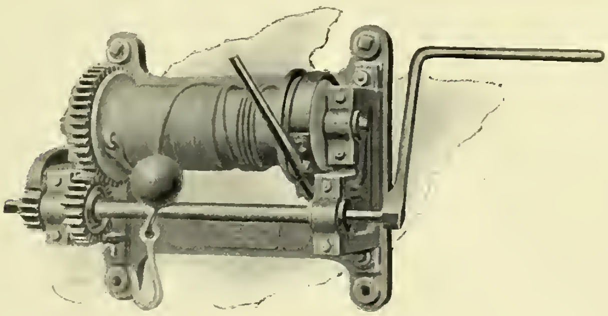


Odense (Denmark) Abattoirs and Export Slaughter-house.



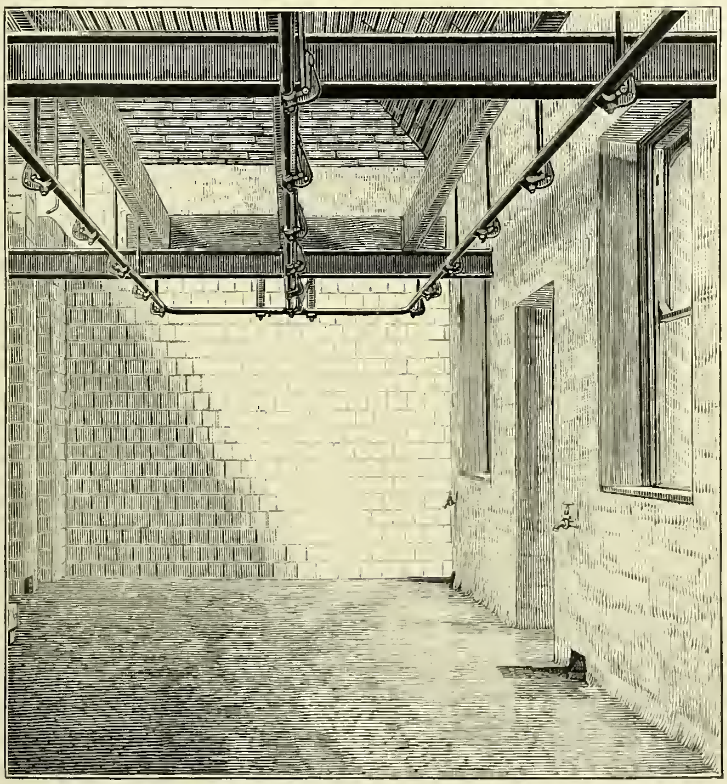
Aarhus (Denmark) Corporation Public Slaughter-house.

Scuttling Table.—A table with top made of convex spar work on which the pigs are scraped.



Wall Hoist.

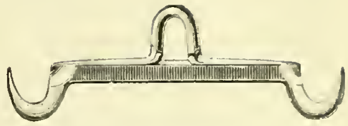
The *Modus Operandi* is as follows:—The pigs are drawn into a small enclosure called the "catching pen" where they are shackled on one of their hind legs with a chain hook and they are then hoisted up by the wall hoist, the hook of which engages the smaller of the two heads in the top of the chain hook. When hoisted to the level of the track bar the hoist is slackened and the larger head of



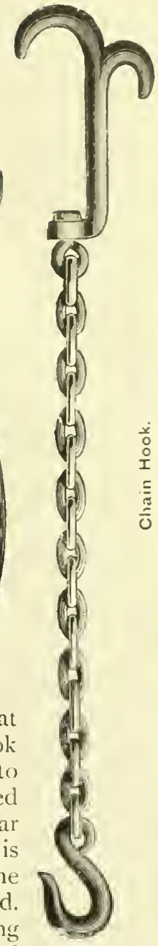
Track Bars (Corporation of Dublin Pig Abattoir).

the chain hook catches on the bar and the pig is thus hung to the bar by one of its hind legs. It is at once stuck and pushed along the "bleeding passage," which should be lined with glazed tiles to permit of easy and thorough cleansing. It is then pushed along over the dumping table where the killing bar ends. The pig falls on to the dumping

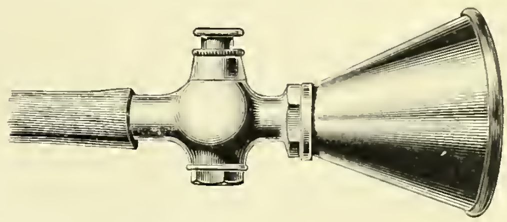
Travelling Hook.



Gambrel.



Chain Hook.

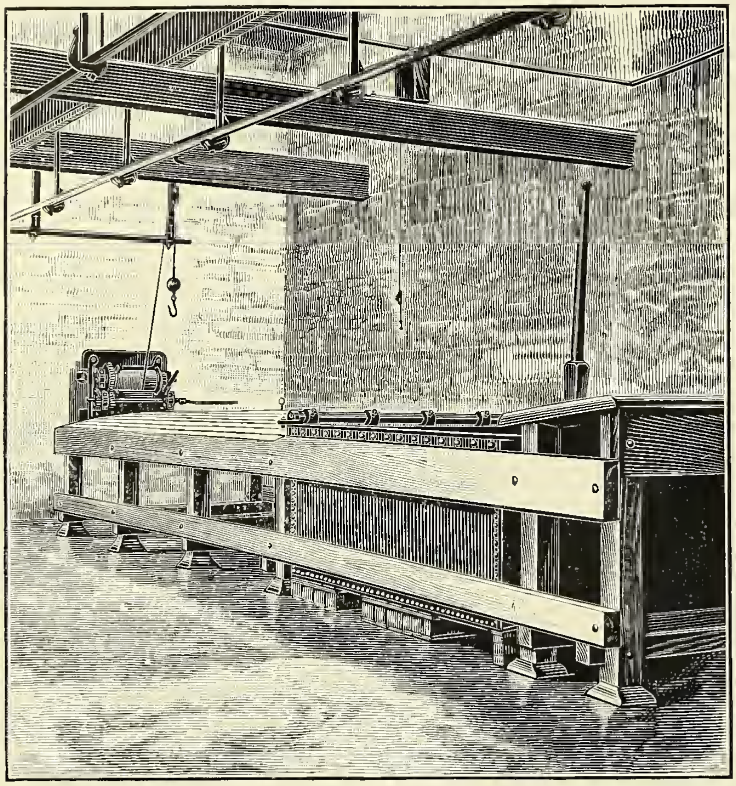


Brass Rose Spring Thumb Valve.

table when the chain hook arrives at the end of the bar, and the chain hook falls away and the pig is rolled into the scalding tank where it is turned over and over until it reaches the far end, where it is on the cradle, and is lifted by the lever right on to the scuttling table on which it is scraped. Arrived at the far end of the scuttling table a travelling hook is fixed behind the sinues of each hind leg and both hooks lifted by the wall hoist up to the track bar, and the carcase is pushed along to the part of abattoir used for disembowelling. Instead of two hooks, it is a common practice to use a gambrel or spreader, and only one travelling hook from which the gambrel is suspended by a ring in the middle.

The carcases are washed on the scuttling table by brass roses connected to water supply by india rubber pipe, the supply being turned at each rose by a spring thumb valve. The washing in connection with disembowelling process is done by sprinklers placed overhead with handles attached for turning the water on. After being disembowelled the carcases are run along the bars to the hanging room, where they are allowed to cool to the temperature of the atmosphere, and they may afterwards be chilled in cold rooms as described under *Refrigeration*.

The plate on the following page shews the arrangement of dumping table, scalding tank, scuttling table, hoist, and overhead bars as described above. It is from a photograph in the Dublin Corporation Pig Abattoir.



Dumping Table, Scalding Tank, etc.

Pig Abattoir (or Pork Slaughter-house) at Bruges, Belgium.—More than a year ago (written November 1899) a distinguished committee of whom Baron Peers of Oostchamp, Bruges, was the leader, made up their minds to construct a large and handsome abattoir for slaughtering pigs at Bruges.

Bruges in Belgium is the centre of a large dairy district, and it was thought that the high quality of pigs demanded by the English market could best be procured in that centre. This forethought has been abundantly demonstrated in practice, as the factory has been since it was started a splendid success. The committee formed themselves into a limited company, under the style of "The Societé Mercurius," Bruges, and under that name they now trade.

Before commencing operations the committee sent a deputation to England and elsewhere, so as to learn what were the various machines and appliances necessary, and which could economically be applied to such an abattoir as was contemplated. This committee was accompanied by Monsieur Dewulf, architect to the city of Bruges, who designed the buildings.

The intention of the promoters was to provide an abattoir in which one thousand pigs per day might be handled, but that to commence with accommodation for five hundred per day would suffice. These pigs weigh about 60 lbs. to 70 lbs. each, and are all intended for England to be sold as fresh pork. The demand for fresh pork in the English market seems to be an ever-increasing quantity, and certainly it is not to be wondered at, considering the high quality which Belgium is able to produce at her dairy farms and elsewhere.

The object to be aimed at in the construction of such a factory is that sufficient refrigerating power should be provided. The main feature of the abattoir, therefore, is a splendid refrigerating machine (No. 9 horizontal carbonic anhydride machine). The equipment necessary for the application of the power of the machine consists of a powerful locomotive type boiler, and various other accessories. The refrigerating machine is attached direct to the engine (capable of developing about 40 b.h.p.), thus obviating any intermediate belting liable to get out of order. The machine also has its separate condenser and evaporator, with their full complement of pumps, these being of the centrifugal type. The system of cooling is by means of circulating the air in the chambers over the cooler. This cooler is placed above the "chill rooms," and by means of a fan or air propeller the warm air from the rooms beneath is drawn over about 1,000 ft. run of pipes, which are in connection with the refrigerating machine, and through which is circulated the cold brine from the evaporator of the machine. This brine is unfreezable, and circulates at from 17·00°C. to 12·50°C. In the process of circulation it withdraws the heat from the surrounding objects, and rises in temperature, but is again restored to a low temperature by being circulated over the evaporator coils, in which carbonic acid is expanded, and during the process of expansion absorbs the heat from the brine. This heat becomes "latent," and is given off again after compression of the expanded gas. It is absorbed in turn by water passing through the condenser, and this water simply runs away, a constant supply being kept up.

The other departments of the abattoir are: styes (with a capacity for five hundred pigs), slaughter-house, skin-house, lard-house, hanging-house, chill rooms—there are three of the latter.

The pigs are driven into the slaughter-pen, and are caught by one of the hind legs, and immediately hoisted on to a track bar, where they are despatched instantly. After being allowed to bleed, they are thrown into a scalding tank of huge dimensions, and are revolved round in it until all the hair is loosened. They are then thrown on to the scuttling table and scraped clean. After this they are hoisted to the hanging bar and dissected. Then, when nicely dressed, they are pushed along the continuous tracking into the hanging-house, and are allowed to hang there a few hours until the excess of animal heat has been dissipated; they are then placed overnight in one of the three chill rooms. In the morning the carcases are taken out, and are in a fine dry hard condition. They are then hung in large crates, holding ten to twelve carcases, and in this condition are immediately shipped to England. They are never packed, but are always hung loose. Hence they arrive in England in splendid condition.

The various intestines are converted into casings for sausage making, and also violin strings, and the blood is used for manure. Thus nothing is wasted.

The abattoir has a great future before it, as, so long as the same high-class produce is shipped to England, and so long as such care is exercised in its preparation, England

General View of the Abattoir.

Les promoteurs de l'entreprise avaient l'intention de construire un abattoir permettant de traiter 1000 porcs par jour ; mais pour commencer on se contenta d'un bâtiment suffisant pour 400.

Ces porcs qui pèsent de 60 à 70 livres sont tous destinés au marché anglais et vendus comme porcs frais. Le porc frais, élevé avec les sous-produits des laiteries belges est très demandé sur le marché anglais, ce qui ne doit pas étonner, lorsqu'on voit la qualité supérieure des produits que l'on y fournit (1).

La condition essentielle d'une telle usine est d'avoir des moyens suffisants de refroidissement. A Bruges, on a installé une machine frigorifique (n° 9 horizontale à l'anhydride carbonique). La force nécessaire pour la mise en activité de cette machine est produite par une chaudière à vapeur du type locomotive, de divers accessoires et d'une machine à vapeur de 40 chevaux effectifs.

(1) Cette appréciation a sa valeur : le présent article nous est envoyé de Londres par un anglais très compétent dans cette branche de commerce.

On sait que le gouvernement belge a encouragé par des subsides, la propagation de la race York-Shire. Déjà plusieurs exploitations agricoles sont devenues des centres de reproduction et de propagation : la ferme de M. le baron Peers d'Oostcamp, la ferme du Comte d'Oultremont d'Houtaing-lez-Ligne, dirigée par M. l'ingénieur Laurent, l'exploitation d'Antour, à M^{lle} de Villers de Grandchamps à Ramegnies-Chin. La Laiterie d'Hamesche a pris l'initiative de répandre cette race dans les fermes de ses coopérateurs.

will always be a buyer of whatever quantity is offered, and be prepared to give the top price for it.

Baron de Peers, as chairman of the company, has testified to the complete satisfaction of the promoters with the way in which the entire installation has been carried out.

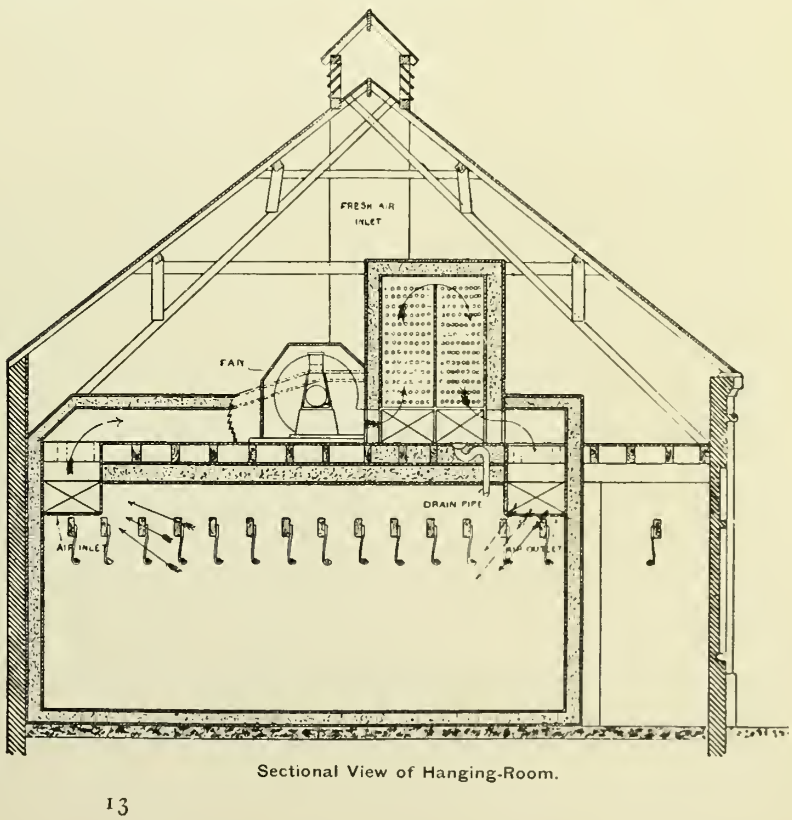
Un Abattoir de Porcs à Bruges.—Il y a un peu plus d'un an, un comité présidé par M. le baron Peers d'Oostcamp résolut de construire à Bruges un immense abattoir destiné à préparer pour le marché anglais les porcs nourris avec les sous-produits de la laiterie.

Le nombre des laiteries augmentant en Belgique d'une façon considérable, on crut pouvoir y obtenir plus facilement la qualité supérieure de porcs exigée par le marché anglais ; les prévisions du comité se sont réalisées car, dés ses debuts, l'abattoir de Bruges a toujours eu grand succès.

La société fut constituée dans la forme anonyme sous la raison sociale "La Société Mercurius de Bruges, c'est sous ce titre qu'elle est connue dans le commerce.

Avant de mettre l'entreprise à exécution, une délégation fut envoyée en Angleterre et ailleurs, dans le but de se mettre en rapport avec les fabricants les plus renommés des appareils nécessaires à cet abattoir.

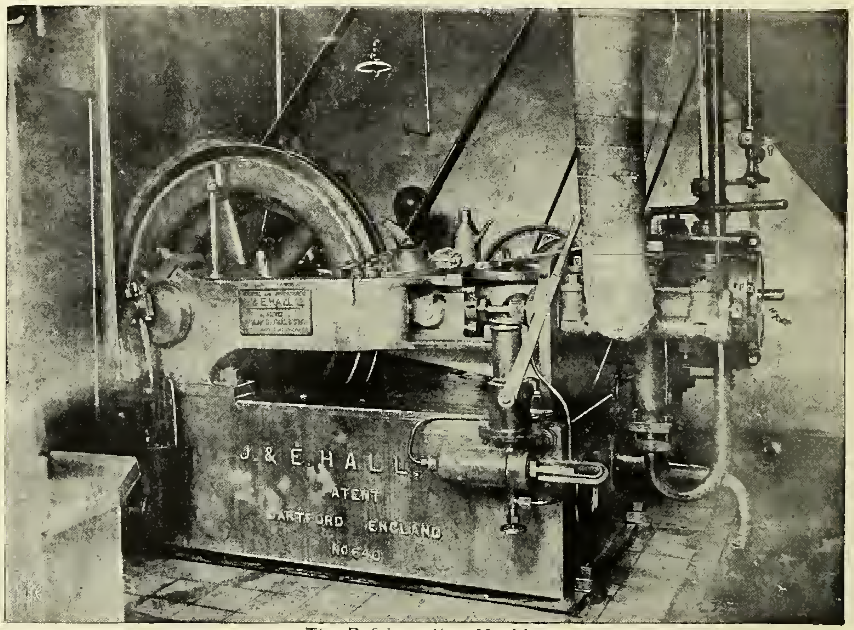
Monsieur Dewulf, architecte de la ville de Bruges, qui était chargé de dresser les plans, accompagna cette commission. Après avoir recueilli des renseignements nombreux, la commission conclut un arrangement avec Messieurs William Douglas et Sons, Limited, 29, Farringdon Road, London, E.-C. qui furent engagés comme ingénieurs. Ce fut cette maison, si bien connue par toute l'Europe pour sa connaissance approfondie de ce genre d'affaires qui organisa et exécuta toutes les installations, à l'entière satisfaction de la société.



Sectional View of Hanging-Room.

La machine frigorifique est actionnée *directement* par la machine à vapeur ; de cette façon, on supprime la courroie qui est sujette à se déranger. La machine possède aussi un condenseur et un vaporisateur avec tout leur complément de pompes (du type centrifuge).

Le refroidissement est obtenu au moyen de l'air qui circule sur le refroidissoir. Ce refroidissoir est placé à la partie supérieure des chambres froides : au moyen d'un ventilateur, l'air chaud des couches inférieures de ces chambres est réparti sur environ 1000 pied te tuyaux qui sont en communication avec la machine frigorifique et à l'interieur desquels circule une solution saline mise en mouvement par le vaporisateur de la machine. Cette solution saline ne gèle pas ; elle circule à une température de 17° à 12,5° F. (—8 à—10°C)



The Refrigerating Machine.

Pendant la circulation, cette solution saline refroidit, en s'échauffant, l'atmosphère ambiante. Elle se refroidit de nouveau en circulant sur des replis vaporisateurs dans lesquels l'anhydride carbonique est comprimé ; celui-ci par son expansion absorbe la chaleur de la solution saline qui se refroidit. Cette chaleur, devenue latente, diminue après la compression du gaz et est absorbée par l'eau qui passe par le condenseur et s'y renouvelle continuellement.

Les autres parties de l'abattoir de Bruges sont : étables à porcs (elles peuvent en contenir 500), abattoir, salles des boyaux, salle du lard, séchoir, 3 chambres froides.

Voici les diverses opérations qui y sont exécutées :

Les porcs sont conduits à l'abattoir où on les saisit par les jambes de derrière et on les hisse sur des tringles : ils sont immédiatement tués.

Après les avoir laissés saigner pendant quelques temps on les jette dans un immense échaudoir où ils sont tournés et retournés jusqu'à ce que le poil s'en détache ; on les jette alors sur un dressoir pour l'épilage. Cette opération finie, on les suspend aux tringles et on les dépèce. Après un dernier coup de grattage on les fait glisser le long des tringles jusqu'à ce qu'ils arrivent au séchoir où ils sont abandonnés pendant quelques heures jusqu'à ce que l'excès de chaleur soit disparu. On les envoie ensuite passer la nuit dans les chambres froides. Le lendemain, les carcasses sont en bon état, fermes et dures.

C'est alors que se fait l'emballage : on *suspend* les carcasses dans de grands paniers qui peuvent en contenir de 10 à 12 et on les embarque immédiatement pour l'Angleterre. Les porcs ne sont jamais encaissés ; ils sont toujours suspendus, séparés les uns des autres ; de cette façon ils arrivent toujours en Angleterre dans les meillures conditions.

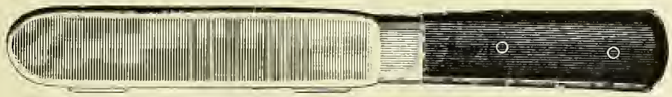

The Hanging-House.

Les intestins sont transformées en boyaux pour saucisses ; on s'en sert aussi pour la fabrication des cordes de violon ; le sang sert d'engrais ; rien n'est donc perdu.

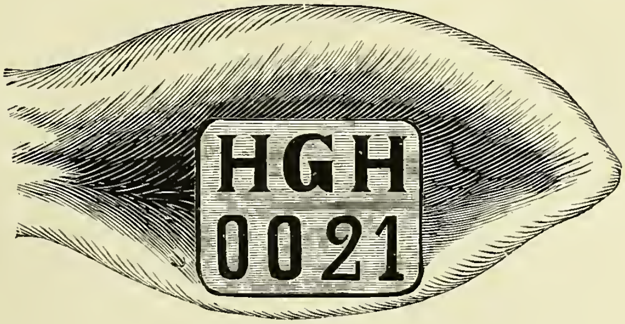
Cet abattoir de Bruges a un grand avenir car tant que les produits qui sont expédiés au marché anglais continuent à être de première qualité et parfaitement préparés le marché anglais sera toujours prêt à les acheter et ces porcs seront toujours très recherchés.

Abattoir Accessories.—Veterinary instruments for meat inspection, humane slaughtering appliances, meat stamps, etc.

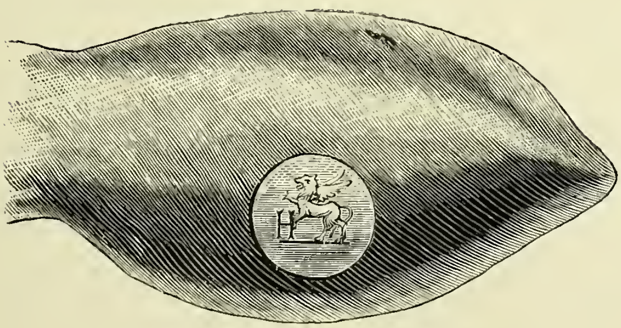
The following illustrations are of various appliances which are coming into use in abattoirs and are likely to be more extensively adopted in the future than they have been. The description under each indicates its particular use.



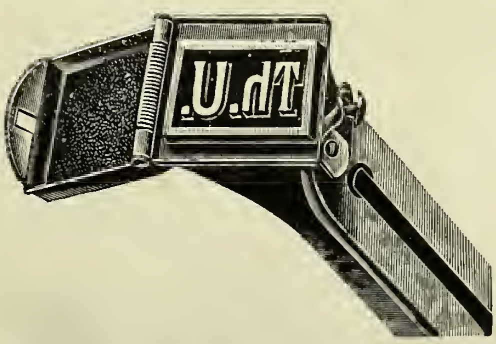
No. 1. Meat Inspection Knife in Aseptic Nickel Sheath.



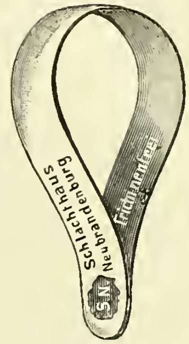
No. 2. An Ear Mark.



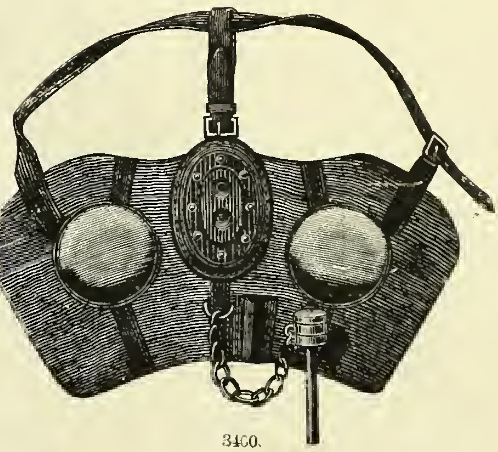
No. 3. An Ear Mark.



No. 4. Koch's Rubber Stamp on Top of Aseptic Knife.



No. 5. Aluminium Meat Seal for Ear Marking.

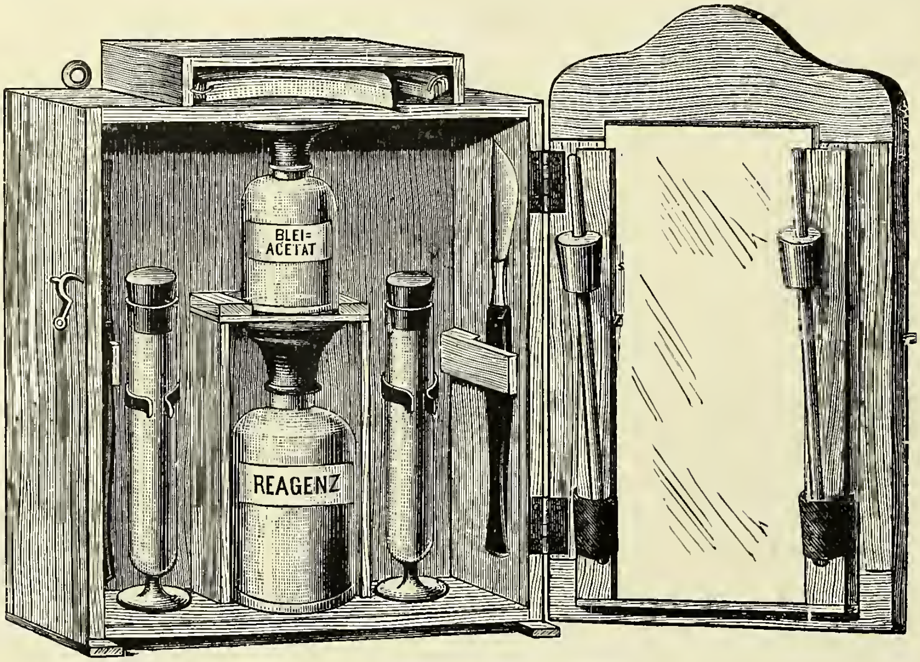


3400.

No. 6. Bruneau Mask for Slaughtering Cattle.

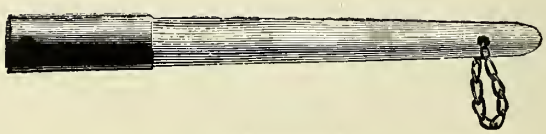
No. 7. India Rubber Meat Marking Stamp.

Contains:—1 Curved Scalpel, 1 Straight Edged Scalpel, 2 Test Glasses, 2 Glass Rods with India Rubber Stoppers, 1 Bottle with Re-agent, 1 Bottle with 30 grains Acetate of Lead, Red and Blue Litmus Paper.



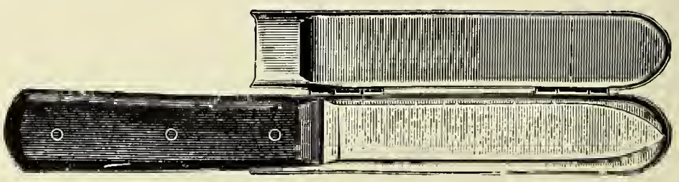
No. 8. Examiner's Testing Cabinet.

No. 9. Slaughtering Hammer for Small Animals.

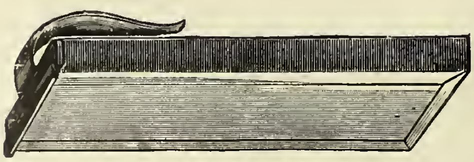


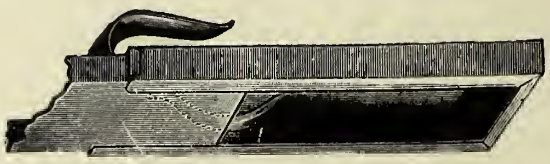
No. 10. Club for Stunning Small Animals.

No. 11. Ribbon Shaped Ear Mark.

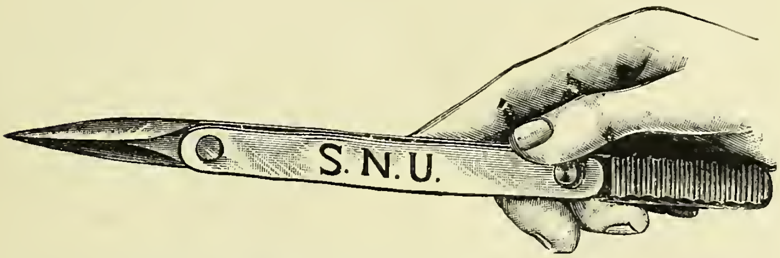


No. 12. Meat Inspector's Knife with Aseptic Nickel Sheath.

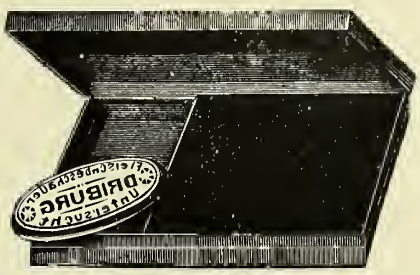




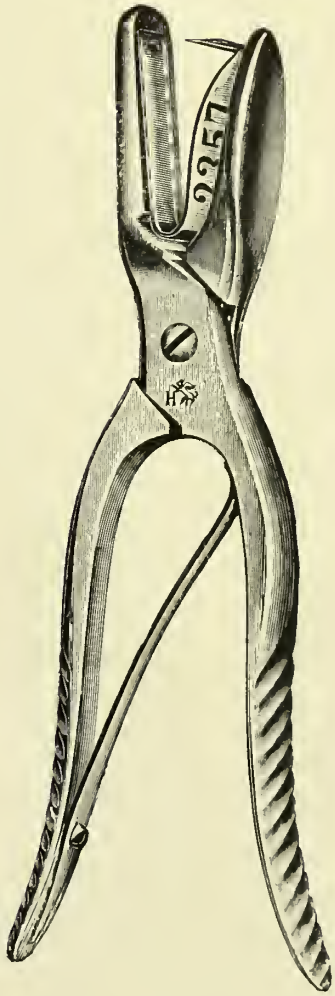
No. 13. Aseptic Knife Sheaths. No. 14.



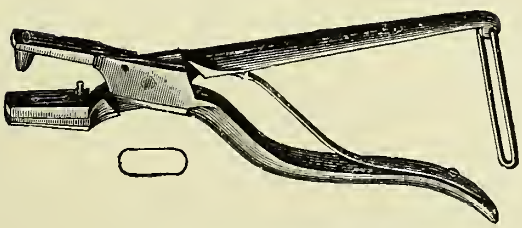
No. 15. Needle for making openings for Meat Seals.



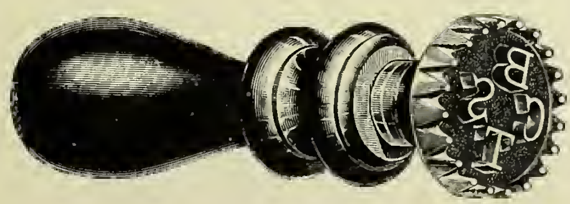
No. 16. Meat Stamp with Pad. In one box.



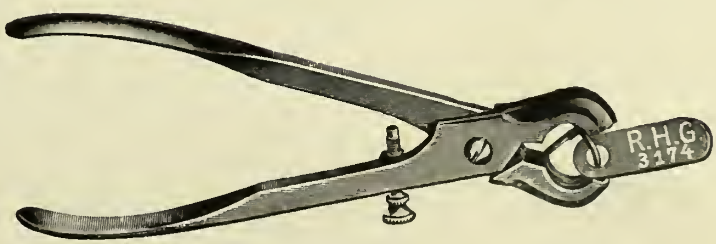
No. 19.
Pliers for fixing Quarantine Marks.



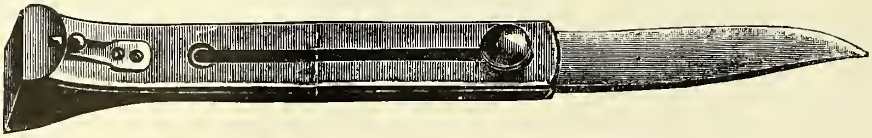
No. 17. Pliers for closing Ear Marks.



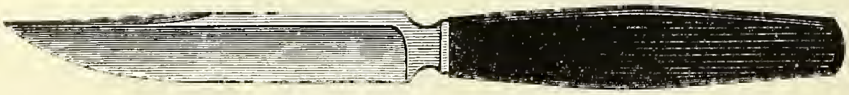
No. 18. Hamburg Meat Stamp



No. 20. Pliers for closing American Ear Marks.

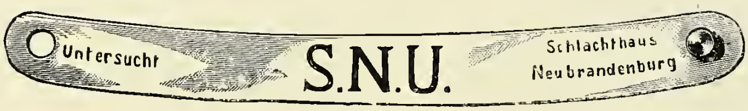


No. 21. Koch's Aseptic Knife with Rubber Stamp.

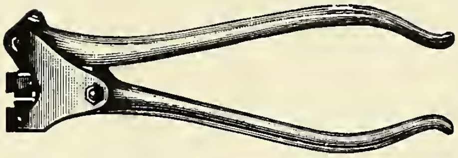


No. 22. Meat Inspector's Knife. (Berlin).

No. 23. Meat Inspector's Pocket Knife.

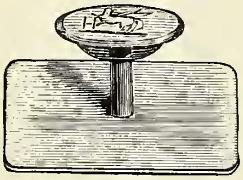


No. 24. Meat Seal.

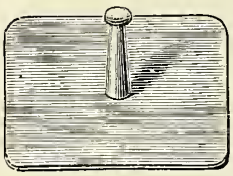


No. 25. Seal Pliers.

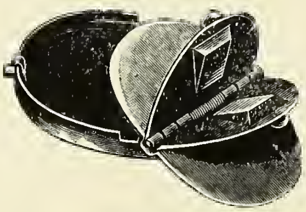
No. 27. Ear Mark.

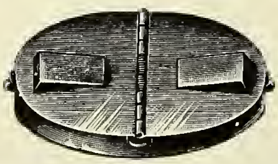


No. 26. Ear Mark.

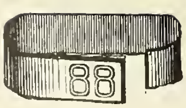


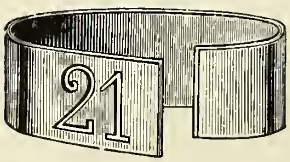
No. 28. Ear Mark.





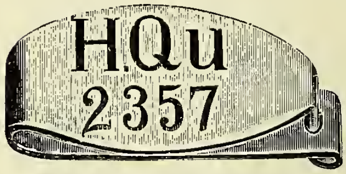
No. 29. Pocket Pad for Meat Stamping. No. 30.





No. 31. Ribbon Shaped Ear Mark. No. 32.

No. 33. Quarantine Mark.

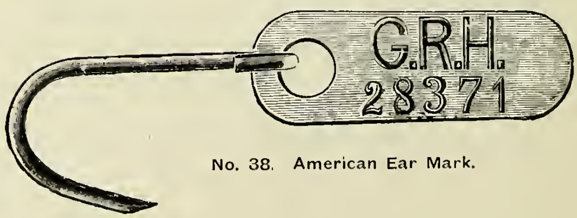


No. 34. Quarantine Mark

No. 35. Quarantine Mark.

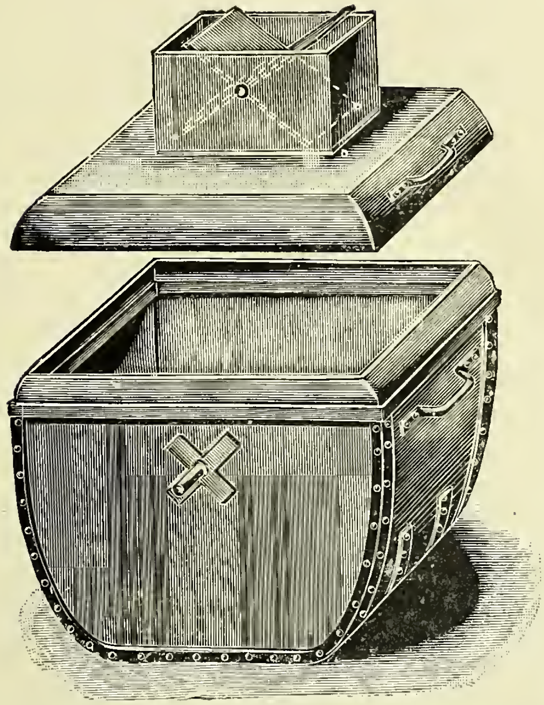
No. 36 Enlarged Impression of Stamp which may be carried in box.

No. 37. Specimen Stamp.



No. 38. American Ear Mark.

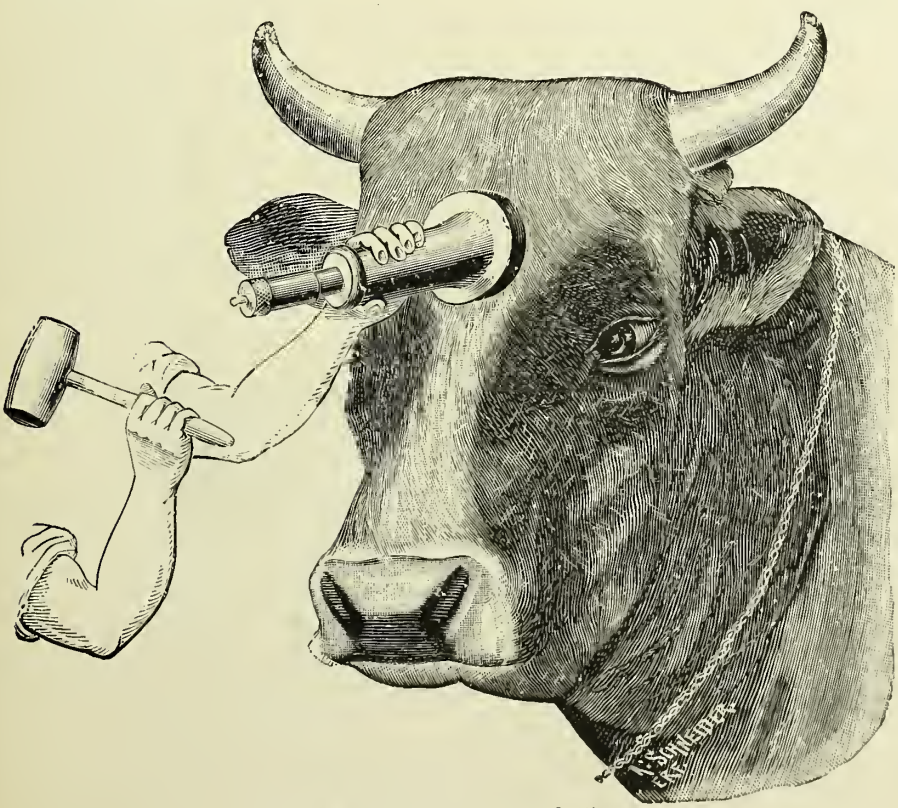
 ABATTOIR ACCESSORIES.



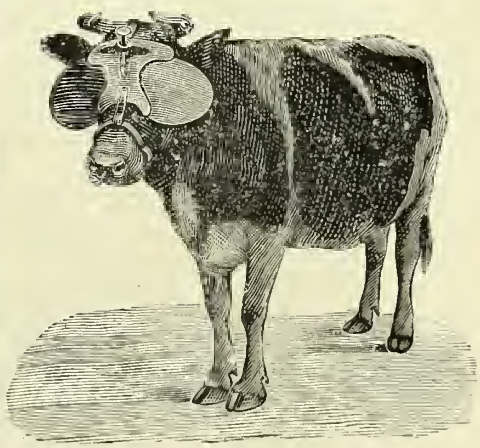
Receptacle for Small Pieces of Condemned Meat and Refuse in use in German Abattoirs.

NOTE.—*The meat, etc., is passed through the revolving shutter and cannot be again extracted except by removal of the upper portion altogether.*

Mutton Rack in use in Paris Abattoirs.



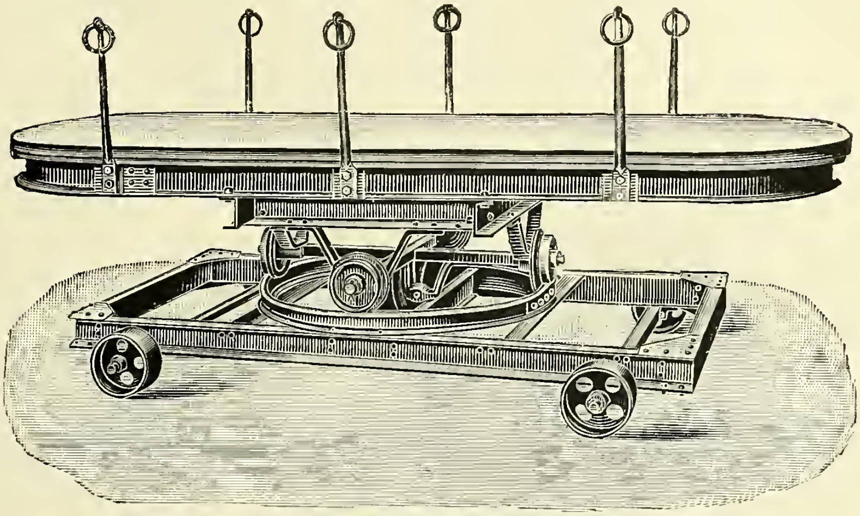
Shooting Apparatus for Large Cattle.



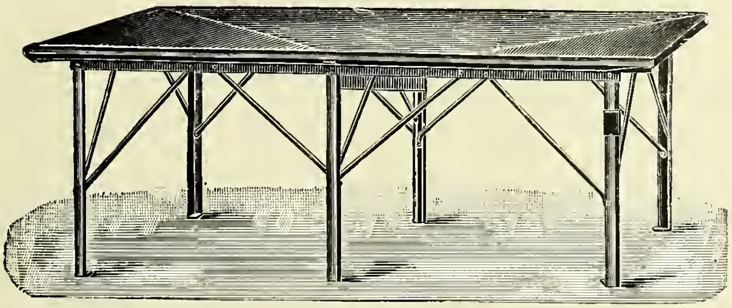
Killing Mask for Cattle (another form of Bruneau's Mask).

Pig Slaughtering and Cooling Room—Barry.

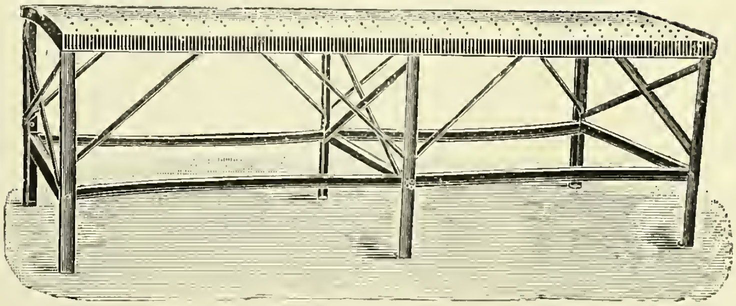
Cattle Lairs and Slaughter-hall—Barry.



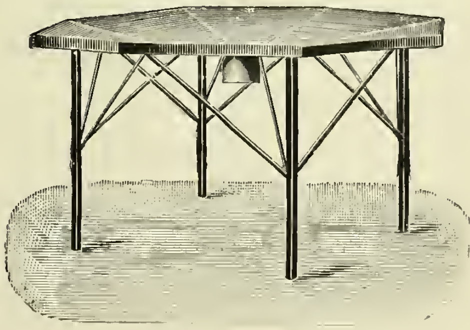
Dissecting Table.



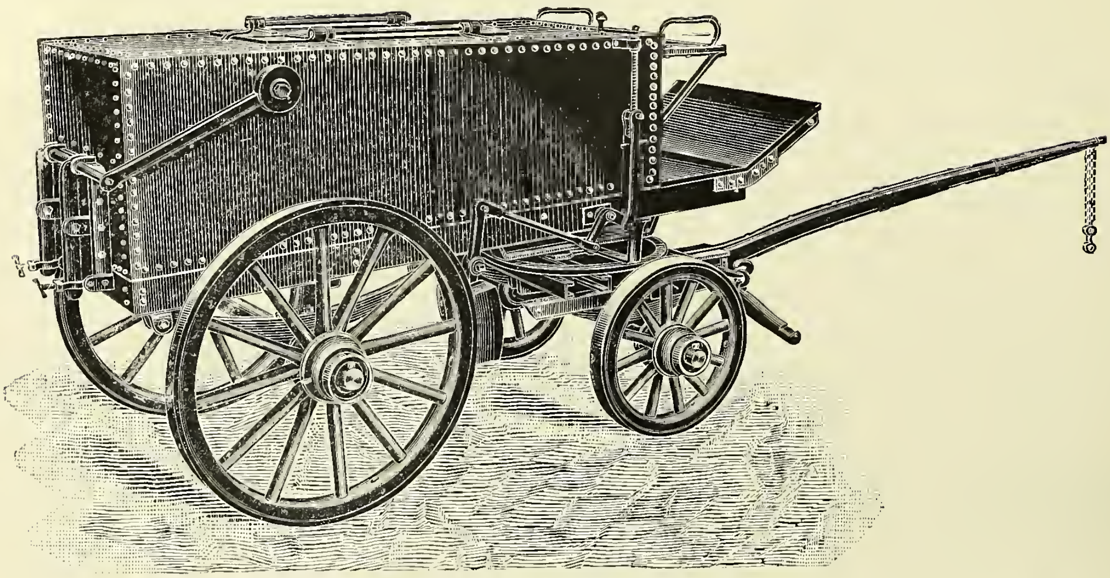
Scuttling Table for Small Animals (German Design).



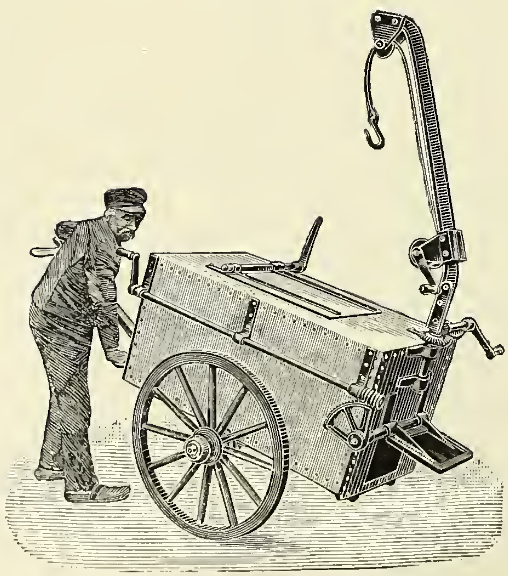
Scuttling Table for Pigs, etc. (German Design).

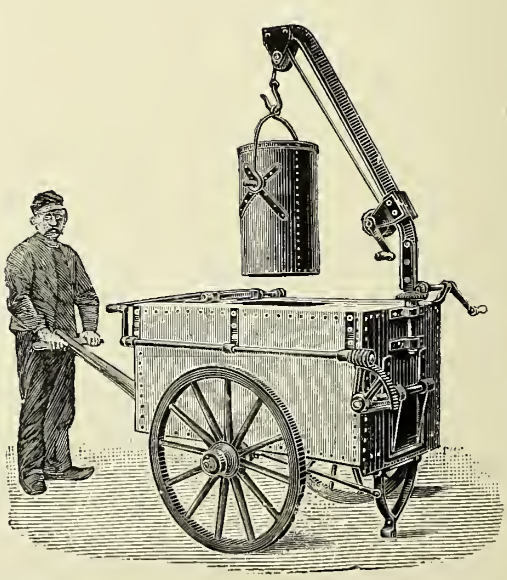


Scuttling Table for Small Animals (German Design).



Waggon for removing Slaughter-house Refuse.





Refuse Hand Waggon with Crane for removing Slaughter-house Refuse

English Provincial Abattoirs.

The growth of the smaller provincial abattoirs in England is very slow, and is likely to continue so as long as the law remains as it is. In England and Wales loans have been granted by the Local Government Board in quite a number of places, as will be seen from the list following. It seems a most difficult matter to get accurate data relative to the abattoirs that are in existence. We have tried to collect some data, but have not been able to get willing assistance from all the officials who could give such data. Hence our information is somewhat limited. It will serve, however, to show the kind of abattoir generally adopted.

List of towns for which the Local Government Board have sanctioned abattoirs :—

Aberavon.	Croydon.	Pontypridd.
Alnwick.	Derby.	Preston.
Barry.	Fleetwood.	Pwllheli.
Beaumaris.	Haslingden.	Rugby.
Birmingham.	Hexham.	St. Annes on Sea.
Blackpool.	Ilfracombe.	St. Helens.
Brighton.	Ilkley.	Sale.
Burnley.	Leek.	Shipley.
Carlisle.	Leicester.	South Blyth.
Carnarvon	Lincoln.	Southport.
Cheltenham.	Llandudno.	Swansea.
Chorley.	Llanelly.	Ulverston.
Clevedon.	Mountain Ash.	West Hartlepool.
Colne.	Oswaldtwistle.	Withington.

Barry.

Description of Public Abattoir.—In 1889, there being no private slaughter-houses then in the district, the Local Authority considered it necessary, in order to save the granting of any licenses for private slaughter-houses, to erect a temporary building, which was built about ten years ago, and served the purpose until about four and a half years ago, when, owing to the rapid development of the town it was found totally inadequate, the question of erecting permanent buildings was considered. A sub-committee was appointed to visit other towns, and present a report on the matter. This was done, and the Committee recommended the erection of public abattoirs on the slaughter-hall principle, and instructions were given to the town surveyor to prepare the necessary plans, sections, estimates, and specification and bill of quantities. This was done, and a Local Government Board inquiry subsequently held, and sanction obtained for £6500 for carrying out the work. The slaughter-houses have now been in full working order for over two years.

A description and sizes of the buildings is as follows :—

The buildings are constructed of red bricks, faced with best Cattybrook wirecut, with dressings of buff brick and terra-cotta, and roofed with blue slate, with red ridge tiles. The slaughter-halls and cooling rooms have dado 4 to 5 ft. high, of white brick glazed, and are fitted with hoisting machinery, and the adjacent roadways are laid in Val de Travers asphalte, on a bed of concrete 6 in. thick. The lairs for sheep and calves have dados of salt-glazed bricks, and are fitted with wrought-iron railings and gates. The lairs for cattle have salt-glazed brick dado, and bars secured to the walls. The drains are all connected to the main sewer, and the site comprises an area of 2 roods 11 perches. The buildings comprise slaughter-hall, cooling room, and lairs for cattle, sheep, and calves in one block. There are also slaughter-hall, cooling room, boiler house, killing pen and lairs for pigs, together with caretaker's office ; also storeroom, drying room, gut-cleaning room, latrine, and urinals. The caretaker's house has four rooms on ground floor, and four bedrooms on first floor.

Sizes of Buildings.

Cattle Lair—68 ft. × 20 ft. × 11 ft. 4 in. to eaves for 38 cattle.

Sheep and Calf Lair—68 ft. × 29 ft. × 11 ft. 4 in. to eaves with fourteen pens, sized 11 ft. 9 in. × 9 ft. 8 in. For 270 sheep.

Cooling Room (for sheep, cattle, and calves)—49 ft. 9 in. × 32 ft. × 17 ft. 3 in. to eaves, with space for 100 sides of beef and 250 sheep.

Slaughter-hall (for cattle, sheep, and calves)—49 ft. 9 in. × 24 ft. × 17 ft. 3 in. to eaves.

Pig Lairs—44 ft. × 21 ft. 1 in. × 7 ft. 6 in. to eaves, with eight pens, 10 ft. × 8 ft. 5 in. for 90 pigs.

Cooling Room (for pigs)—30 ft. × 19 ft. 11 in. × 13 ft. 6 in. to eaves, with space for 150 pigs.

Slaughter-hall (for pigs)—30 ft. × 19 ft. 11 in. × 13 ft. 6 in. to eaves.

Killing Pen—15 ft. × 9 ft. 7 in. × 11 ft. to eaves.

Boiler House—15 ft. × 9 ft. 7 in. × 11 ft. to eaves.

Office—14 ft. × 14 ft. × 11 ft. to ceiling.

Storeroom—20 ft. 8 in. × 14 ft. × 12 ft. to eaves.

Drying Room—20 ft. 8 in. × 14 ft. × 12 ft. to eaves.

Gut-cleaning Room—20 ft. 8 in. × 14 ft. × 12 ft. to eaves.

The floors of all the buildings are of granite paving, laid *in situ* on 6 in. of concrete. Rails are provided throughout the building with travelling pulleys, so that carcases can be run from one building to the other, and thence direct on to a Pooley's weighing machine, arranged so that the side of a beast can be weighed at one time. There is one entrance only to the whole of the premises, which adjoins the office, so that nothing can enter or leave the premises without passing such office, thus giving the manager better control. The cost of the buildings was £6500. They were carried out from designs prepared by, and under the supervision of Mr. J. C. Pardoe, A M.I.C.E., surveyor to the Council.

Blackpool.

The following paper by Dr. Jasper Anderson, of Blackpool, read before the N.-W. Branch of the Society of Medical Officers of Health, gives a special insight into the abattoirs of this town.

Public Slaughter-Houses and Meat Inspection.

Although in many respects English sanitation is in advance of continental, yet in the matter of meat inspection we are sadly behind the methods of some foreign countries, notably Germany. As at present conducted, meat inspection is the most unpleasant and harassing duty of the Medical Officer of Health or Inspector of Nuisances. Through there being no regular inspection of every carcase his visit to the slaughter-house is resented very much, and his reception is far different from that which he receives in the execution of his other duties. Then, again, if the sanitary officials are known to be active in this direction, any suspicious animals are slaughtered in the outlying rural districts, the carcase dressed, and brought into the town in the early morning hours. Such cases are only discovered by the merest chance, or by a long and expensive period of watching, or by information given by someone who has quarrelled with a person interested in this nefarious trade. I was

lately fortunate in dropping upon a case of this sort, and then, having had the diseased beast watched until slaughtered, secured a conviction after a deal of expense, anxiety, and ridicule.

The system of meat slaughtering and inspection in Berlin seems to be perfect, and to give satisfaction not only to the public, but also to the cattle and butcher trades. A cattle market and slaughter-house have been provided on the north-east of the town, near to the city and railway. This has been built at a cost of about half a million of money. The buildings placed upon the site cover fully twenty-seven acres. All cattle that are to be offered for sale in Berlin must be brought hither, and the slaughtering of cattle is absolutely forbidden anywhere else in the municipal boundary. On market days all cattle sold for slaughter are transferred to the butchers' stalls in the slaughter-house.

All dead meat of animals slaughtered in the country or abroad, and intended for consumption in Berlin, must be brought here for inspection; no butcher being allowed to expose for sale meat intended for human consumption without bearing the official stamp of the inspecting department. The inspecting department consists of a chief meat inspector — a veterinary surgeon — with twenty-two veterinary surgeons and assistant surgeons to help him, as well as special inspectors, microscopists, and stampers. The microscopical examinations are made by forty-five women, who are paid about £75 per year, and work five hours daily. Even after paying for sinking fund, interest on capital, maintenance, and the cost of the inspecting staff, there is a revenue of about 4 per cent. on the capital outlay. Carcases of animals affected with tubercle, trichinosis, anthrax, and other diseases are destroyed; whilst in cases of local unsoundness, and in other cases, the meat is treated by Rohrbeck's process, and then sold for human food, being ticketed as such, and in special shops. (Freibanks.)

In Paris, at La Vilette, there is a very perfect slaughter-house, with a staff of eight veterinary surgeons to inspect the animals before slaughter; there, again, all the organs must be retained until inspected after slaughter. In Brussels, Antwerp, and Copenhagen there are similarly equipped slaughter-houses.

The public slaughter-house which is now erected in Blackpool, and is in partial use, has been in contemplation since 1885, and the plans were not prepared until after a full and careful inquiry into similar buildings elsewhere. The objects sought to be attained by the erection of this slaughter-house were (1) The provision of one suitably situated building in the Borough, with a special siding from the railway, so that cattle might be brought directly to the building. (2) The closing of all private slaughter-houses in the town, which not only are nuisances when near to dwellings, but also difficult and costly to supervise as to their cleanliness. By the council having wisely gained power in an Improvement Act in 1879 to close all private slaughter-houses erected after that date, when a public slaughter-house was provided, in a few months, I shall be able to close every private slaughter-house in the town, with perhaps one exception. (3) The institution of a thorough inspection of each carcase and its accompanying viscera. (4) The provision of places to deal with the guts of animals slaughtered, the blood, skins, and other offensive trades which are carried on after slaughtering. All these places being constantly under the surveillance of the Corporation servants, they may be kept clean and as free from offence as possible, and at the same time removed from the habitations of the people. (5) The provision of a cattle market for all beasts, etc., brought into the town for sale. On the border of the railway siding are placed twelve pens, into which the animals can be directly untrucked. Then comes a paved street, about twenty feet wide, on the other side of which are the entrances to the twelve fasting lairs. From these there is an entrance to the slaughter-house, but it is so arranged that a living animal may not see the process of slaughtering going on.

There is an opening from the slaughter-house proper to the hanging room. We have therefore built twelve slaughter-houses, but the partition wall between the two central ones has not been built, so that this can be used as a public slaughter-house. The other ten are let off to butchers, on the understanding that if necessary they will be required to sub-let to another butcher, if required to do so by the Corporation. The two central ones are intended for butchers who have not a sufficiently large business to warrant them taking a slaughter-house, or joining with another butcher for one, and who will pay so much per beast, etc., killed. The interior of the lairs, slaughter-houses, and hanging rooms are lined with white glazed bricks to a height of eight feet six inches, and above that with ordinary bricks whitewashed. The floors are laid with good three inch flags, set in cement on a concrete basis four inches in thickness. It was decided that this would be better than any cement covering, as it would not be so slippery. The buildings run nearly east and west, with a skylight in the northern slope of the roof, so that there may be plenty of light with as little heat from the sun as possible. Ventilation is provided for by hit and miss ventilators to the under part of all the windows of the hanging rooms and lairs. Along the whole ridge of the roof there is a louvered raised section, so as to afford a large outlet for air. The sewers are to be ventilated by being connected with the shaft of the chimney, and leaving the manhole coverings at the dead end open. The pig slaughter-house consists of five styes, made of good, smooth flags bolted together, set on a floor of good cement. This leads to the slaughter-house proper, where there are two scalding tubs. There is also a hanging room provided. In all the slaughter-houses the latest hoisting apparatus, rails and blocks have been provided. Adjoining this there is the boiler house, with a large Lancashire boiler for the supply of steam. Then there is a common room for the butchery, and a room for condemned meat. Away from these there have been provided three out-buildings, one for blood, and the others for gut-scraping purposes. Two houses are to be provided in connection with the slaughter-houses, one for the caretaker, who has been recently appointed, and was previously a butcher, and the other for the meat inspector. The total cost will be about £13,000. There is land around to an extent of about sixteen acres for grazing purposes.

There does not appear at present to be any difficulty in getting butchers to give up their present unsatisfactory slaughter-houses, and use the public abattoirs. But for some years past, in consequence partly of the anticipated completion of the slaughter-house, and also of the increased efficiency of the meat inspection in private slaughter-houses, some of the butchers have erected slaughter-houses in the rural districts just beyond the confines of the Borough. By educating the public as to the needs of an efficient inspection of all carcases immediately after slaughter, I hope to checkmate this movement; and if no general legislation is

passed in the meantime covering this point, we intend that the next time a Bill is promoted by the Corporation in Parliament to seek for powers to demand that all meat from animals which have not been slaughtered in the Borough be brought to the slaughter-house for inspection.

Bolton.

The cost of the site was £6175, 6s. 9d ; the building and fittings, £6210, 16s. 4d.; total, £12,386, 3s. 1d There are sixteen slaughter-houses and one piggery.

Brighton.

The cost of the public abattoir, not including the site, was £12,046, 18s 8d. It comprises the following buildings :—

One public slaughter-house with three hanging rooms, and three lairs, with accommodation for bullocks and sheep in each lair.

Three private slaughter-houses with hanging room and lair to each.

One public pig slaughter-house with lairs and hanging room.

One private pig slaughter-house with lairs and hanging room

Fasting lairs, hide shed, superintendent's office, superintendent s house.

The amount of trade is published in Dr. Newsholme's "Annual Report on the Health, etc., of Brighton for 1899," as follows:—1899 is the fifth complete year of working the abattoir.

The following statement, supplied by Inspector Cuckney, the superintendent of the abattoir, gives the number of animals slaughtered in the public and private slaughter-houses at the abattoir :—

Year.	In the Public Slaughter-Houses.					In the Private Slaughter-Houses.					Total.
	Beasts.	Calves.	Sheep.	Lambs.	Pigs.	Beasts.	Calves.	Sheep.	Lambs.	Pigs.	
1899	1409	653	5650	491	3560	—	—	—	—	4621	16.384
1898	1008	503	4114	458	2645	6	11	229	31	3322	12,650
1897	589	384	3077	224	2442	16	69	1145	158	3950	12,054
1896	333	253	1549	201	4134	58	69	990	201	3391	11,184
1895	89	95	694	113	4182	187	71	1231	329	—	6,991

During 1899 about three trucks a week, containing cattle, sheep, and pigs have been unloaded at the abattoir siding, in accordance with the arrangements made in April 1898 with the railway company. It still remains true, however, that five-sixths of the animals for the abattoir are driven through the streets from the New England Road Cattle Dock to the abattoir, a distance of over three-quarters of a mile. This arises, as explained in my last annual report, from the fact that certain drovers who contract for bringing animals from the various country markets to the thirty-eight private slaughter-houses in various parts of Brighton, do not separate the animals at the various markets, and consign such as are intended for the abattoir, directly to it. It is only when this is done that the railway company will deliver at the abattoir siding. The one thing which would hasten more than anything else the abolition of the present extremely unsatisfactory state of matters, which is a danger and source of nuisance to all the inhabitants along the line of roads traversed by the driven animals, would be the more rigid and complete enforcement of the Borough Bye-laws as to driving cattle through the street.

Unsound Food seized or surrendered during 1899.

Description.	Number of Animals.	Number condemned by Magistrate.	Number destroyed by arrangement with Owner.	Total weight in lbs.
A.—At the Abattoir—				
Bullocks (whole carcase) - -	6	—	6	5114
,, (part of carcase) - -	161	—	161	2086
Calves (whole carcase) - - -	2	—	2	126
Sheep (whole carcase) - - -	5	—	5	262
,, (part of carcase) - - -	14	—	14	33
Pigs (whole carcase) - - -	24	—	24	2870
,, (part of carcase) - - -	526	—	526	4364
B.—In the Private Slaughter-houses and Shops—				
Bullocks (whole carcase) - -	14	1	13	8391
,, (part of carcase) - -	194	17	177	5757
Calves (whole carcase) - - -	6	—	6	256
,, (part of carcase) - -	9	—	9	53
Sheep (whole carcase) - - -	9	—	9	531
,, (part of carcase) - - -	23	—	23	65
Pigs (whole carcase) - - -	45	13	32	2975
,, (part of carcase) - - -	6	6	—	33
Totals - - - - - -	1044	37	1007	32916

The total amount of meat destroyed in connection with the private slaughter houses and shops was 18,061 lbs.; at the abattoir, 14,855 lbs.

All the above meat was voluntarily surrendered by the butchers after official inspection In a considerable number of instances the butcher sent for the inspector to view the meat.

Blyth.

The Urban District Council of Blyth erected ten new slaughter-houses in 1900.

Burnley.

The Burnley public abattoir was opened in January 1879, and has been enlarged from time to time, notably in 1880, whilst in August 1880 Bye-laws relating to slaughter-houses were passed. The first cost of the building was £8800, but with the additions, £11,000. This is exclusive of the land.

The abattoir occupies the site of the old Union Workhouse, and is situate at the junction of Royle Road and Ashfield Road, and is adjacent to the pig market and newly-erected cold stores. These stores are not yet opened It superseded thirty-nine private slaughter-houses, and is self-contained, with lairages, slaughtering-rooms, pans, steam, hot and cold water, etc., and is under the supervision of the manager, Mr George Astin. Mr Astin has had control for nearly twenty-one years.

The corporation veterinary and meat inspector is Mr James Kenyon.

The following figures show the average number of animals killed during the five years 1896 97-98-99 and 1900 :—

Beasts.	Sheep.	Lambs.	Calves.	Pigs.
5350	17,637	15,720	949	5858

Whilst the average income for the same period was £781.

The following is the scale of charges for use of abattoir, for slaughtering beasts, 1s ; lambs and sheep, 2½d.; calves, 4d.; pigs, 6d.; whilst additional charges are made for lairage if

kept over one or two nights—beasts, 3d. each, and other animals, 4d. per score per night. There is lairage for 1500 sheep, 120 beasts, and for 500 pigs in the pig market.

The refuse from the abattoir and pig market is removed daily to the Borough refuse destructor, and there burned.

CARLISLE.

The public slaughter-houses in this city were erected in 1887 at a cost of £6900, made up as follows:—

Purchase of site - - - - - £800
Buildings - - - - - - £6100

The average income is £550. The public slaughter-house is under the control of a superintendent, who is a practical butcher. The accommodation has been found insufficient, and recently the corporation have decided to extend the premises at a cost of over £2000.

DUBLIN ABATTOIR

Is one of the most progressive in the United Kingdom. It has been fitted out with refrigerating plant and has a specially designed pig abattoir. There is also a scheme to provide an apparatus for the utilisation of diseased meat, blood, etc., likely to be carried out in the near future.

The number of animals handled may be seen from the following figures.

Number of Beasts, Calves, Sheep, and Pigs killed in the Abattoir and Tolls realised on same for the years 1896, 1897, 1898, and 1899.

Year.	Beasts.	Calves.	Sheep.	Pigs.	Tolls.
1896	5727	197	16,551	1309	£1585 0 10½
1897	4802	170	14,953	768	1377 17 0
1898	5625	244	16,336	882	1425 17 8
1899	5764	157	18,538	1368	1286 7 10½

HANLEY, STAFFS.

There is only a small set of abattoirs, and they have not paid particularly good interest, though they have prevented any increase to the number of private slaughter-houses which are licensed in the Borough. They are six in number, one of them being reserved entirely for pigs, another is let off at an annual rental, leaving four for the general public at so much per head of beasts killed. Each slaughter-house is 24 ft. long by 17 ft. 6 in. broad, and attached to it is a clemming house or lair, which is 22 ft. 3 in. long by 17 ft. 6 in. broad. This group of abattoirs adjoins the cattle market.

HUDDERSFIELD.

The Huddersfield public abattoir was erected about fifteen years ago at a cost of some £15,000, there is accommodation provided for the slaughter of cattle, sheep, and pigs, with lairages and resting places, besides the ordinary killing apartments. On the same premises also places are provided, and arrangements made with certain firms for treating the various refuse products, such as blood, guts, etc. Just recently there has also been erected, in connection therewith, proper cold air storage accommodation, in order to assist the butchers in properly keeping their meat in hot weather.

The establishment of this abattoir has undoubtedly been of great assistance in maintaining the high standard of the food supply in this Borough, as the majority of the meat sold in the Borough is killed at these premises, thereby ensuring efficient supervision of the animals and carcases. During the last three years 17,753 cattle, 38,805 sheep, and 19,090 pigs have been slaughtered, and 9437 carcases have been brought into these premises, from which it will be seen that the same are in pretty constant use.

ILFRACOMBE.

The slaughter-house, built by the District Council for the use of butchers in the town, not having been used by them, it has been let to one of them to get what he can by re-letting.

LEEDS.

The abattoir which was constructed in 1899 for Leeds is typical of what is considered necessary for the requirements of a modern city.

The site consists of 3260 square yards, and the whole of this area has been built upon up to the street lines. The cost of the market when completed will be about £25,319, exclusive of the land.

For convenience of description, the buildings may be classified as follows:—

(1) Market hall for sale of meat, and official block.
(2) Slaughter-houses and lairages for beasts and pigs.
(3) Tripery, blood, and gut rooms.
(4) Basement for cold stores, and chill rooms.

Market.—The wholesale meat market is the largest and most important building on the site, running parallel with New York Street, with entrance and official block facing St James's Hall.

This building is separated on one side from the slaughter-houses by a covered roadway for carts and waggons. On the opposite side to New York Street, direct communication is obtained by means of separate doorways for each stall.

The question of lighting has been fully considered, and the main point of keeping the rays of the sun from the stalls has been observed. The roof is in one span, carried on wrought iron bindings, and the walls for the full height are in white glazed bricks.

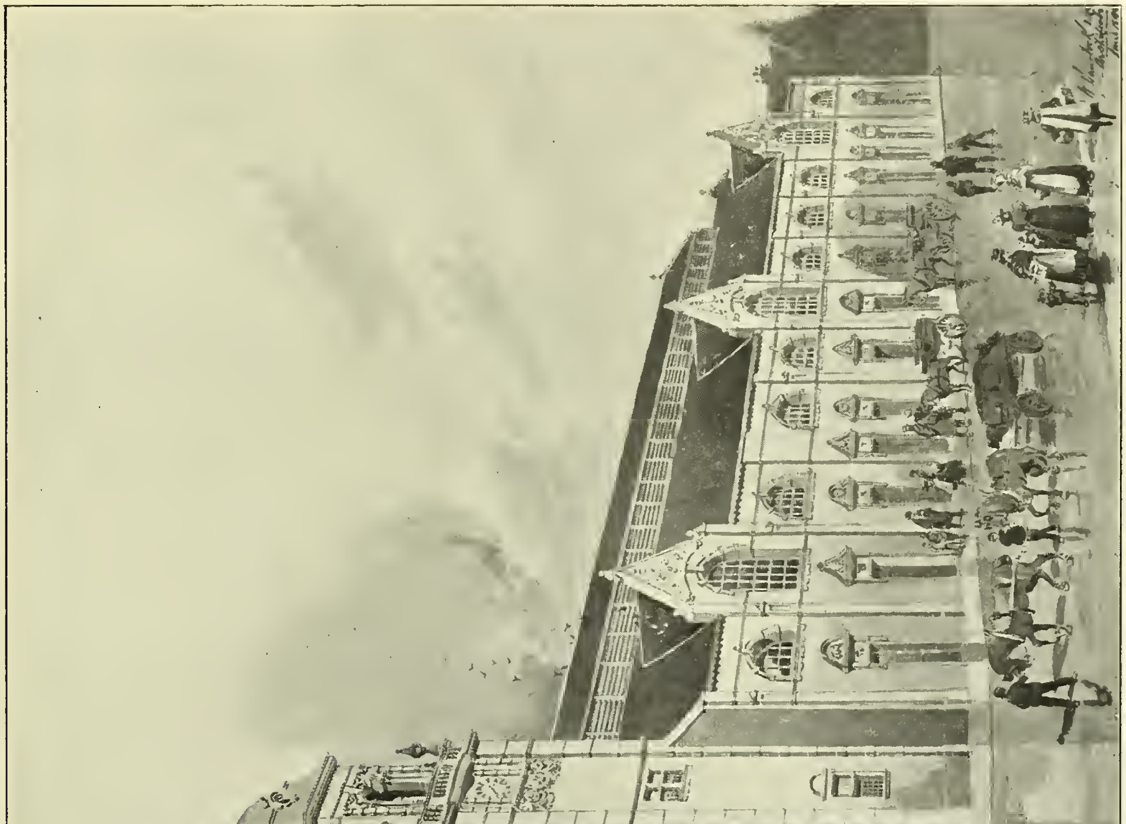
The market is 195 ft. 4 in. long and 45 ft. wide, the height to the eaves of walls being 25 ft. 8 in., and the height to ridge 41 ft. 6 in.

Hanging accommodation is provided for 1100 sides of beef, and 1540 sheep, pigs, or quarters, and is divided into twenty-two stalls, with centre avenue from end to end.

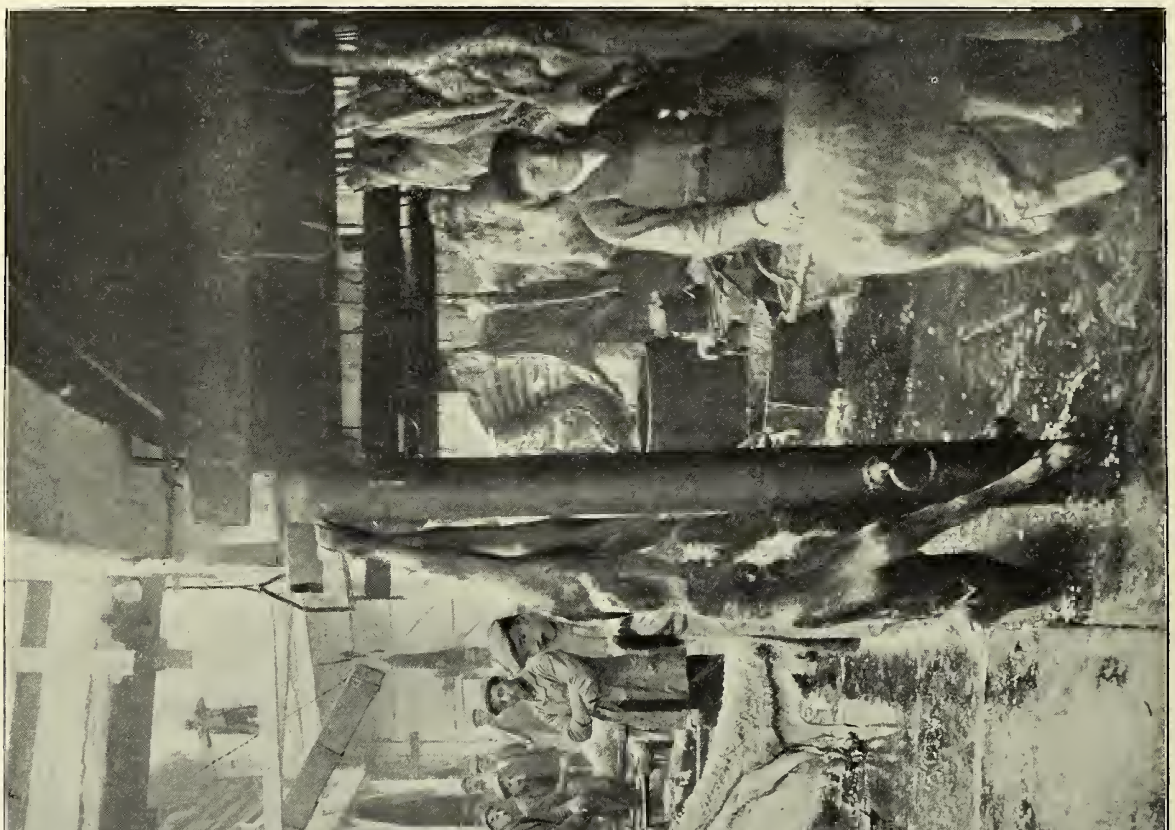
A complete system of overhead travelling rails has been adopted throughout this market, and it is considered that the scheme is the most modern and improved of its kind. From the killing of the beast to the selling of the carcase, the whole of the lifting and travelling is done by means of connected lines, the slightest pressure being sufficient to propel these loads.

Each stall has direct communication with each individual slaughter-house, without the disadvantage of passing through the stalls. Also the carcases, if desired, may have direct communication with the hydraulic hoists for conveyance to the chill rooms or cold stores below.

The communication from the market to the slaughter-houses is through the covered roadway, thus providing a speedy means of loading waggons while waiting in the road. A similar method has been adopted in connection with the doors on the New York Street side where the rails continue to the wall face for discharging the meat on to lorries in New York Street.

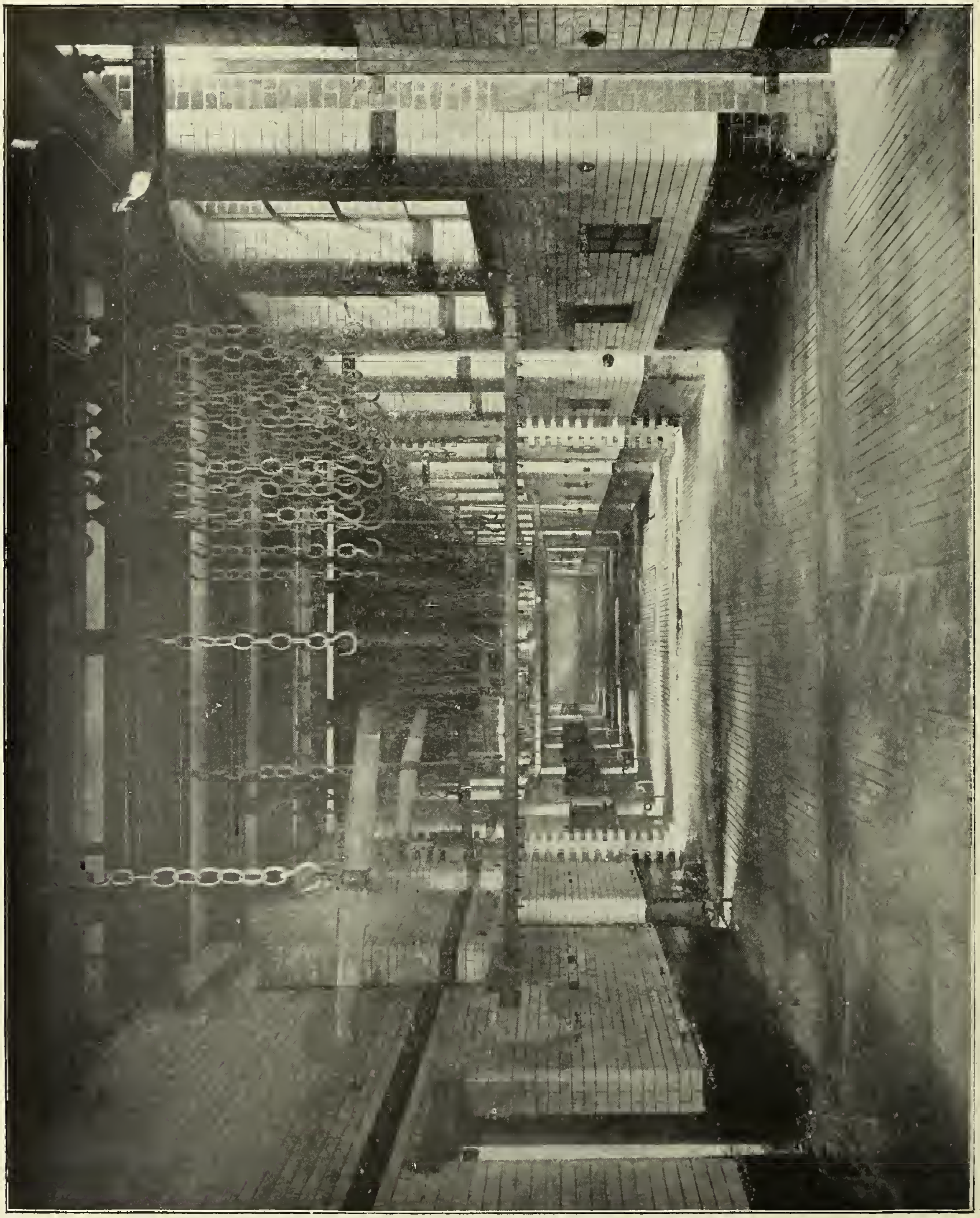


Leeds New City Meat Market and Slaughter-houses—Exterior View of Market.

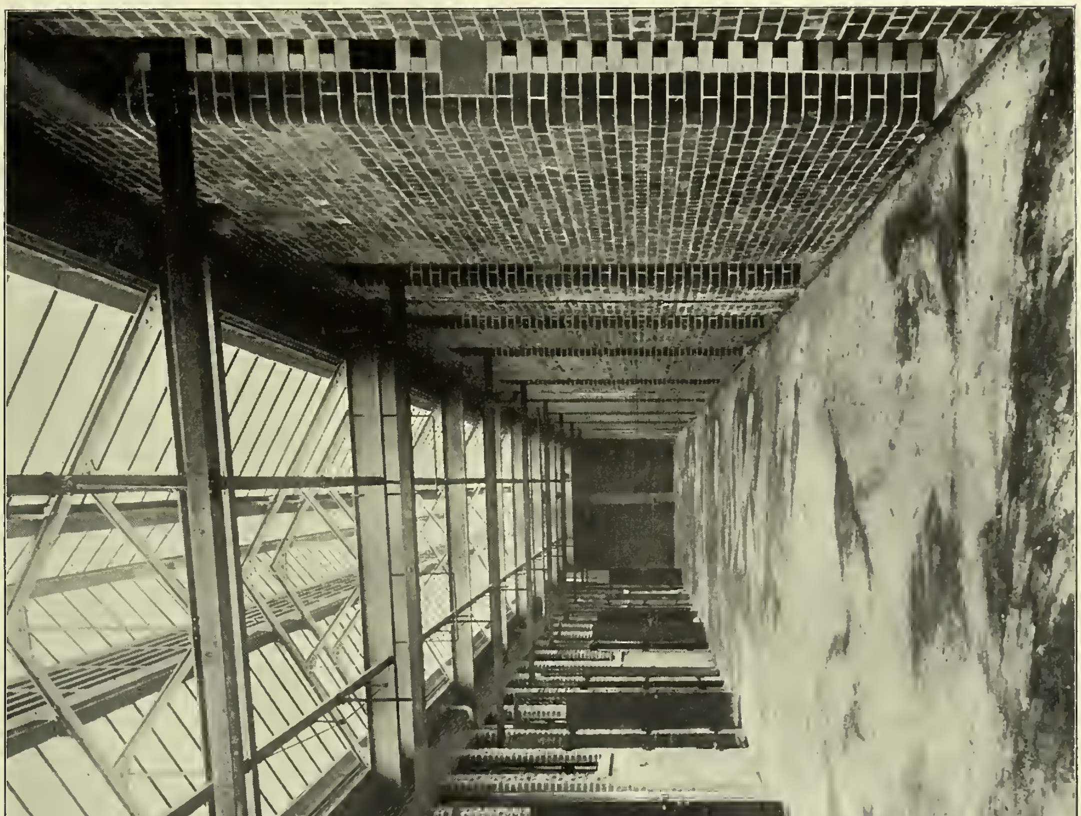


The old Shambles—Leeds Slaughter-house, now superseded.

Leeds New City Meat Market and Slaughter-houses—Interior View of Market.



Leeds Abattoirs—Interior View of Slaughter-house.



Leeds Abattoirs—View of Covered Roadway.

The market is fitted with 322 incandescent electric lamps of 32, 25, and 16 candle power.

The salesmen's offices are placed over the central avenue at each end of the market, thus taking up none of the floor space. These are approached by staircases from each end, and are connected in the centre by means of a gangway.

Two hydraulic lifts are placed at the end of the market and the covered roadway for direct communication to cold stores.

The floor of the market is of fireproof construction, in concrete.

The front or official block comprises entrance, with manager's office, lavatory accommodation, etc., on the north side, and with private entrance to the caretaker's house on the south side.

Over these buildings a spacious house is provided for the caretaker, consisting of sitting-room, kitchen, bath, lavatory, etc., and three bedrooms.

Slaughter-Houses for Beasts and Pigs, and Lairages to same.—The slaughter-houses for beasts are adjoining the covered roadway, and run in a parallel line with the market, with the end facing to Harper Street. These are placed in a central position, being connected with the covered roadway and market, and on the north side with the lairages, tripery sections, back entrance, and all other parts.

Each slaughter-house is fitted with the necessary apparatus, allowing two sets of men to work at one and the same time. The line of slaughter-houses are fitted with fifty-four incandescent electric lamps of 32 candle power each.

In the rear of each slaughter-house, waiting-pens are provided for beasts, directly in communication with the north doorway.

Over these slaughter-houses, lairages are provided for 100 beasts, and over tripery, blood, and gut rooms, lairage may be found for 120 sheep. These lairages are approached by means of an inclined way from ground level to first floor level, made to an easy gradient, with Drovers' safety passage and inlets to the same.

The sloping way is covered with a glass roof for the full length. The floors of lairs are in concrete, with ceilings boarded and walls in pressed brickwork. The pens are constructed in the best pitch pine, with approved troughs and water supply.

The drainage of this section of the building and the slaughter-houses below has received careful attention. The principle adopted has been as follows:—The concrete floors of lairages are specially constructed to convey the sewage to a cast-iron gutter which is fixed on the external wall, and from this it is conveyed down the face of the wall to the ground floor level and connected to channels in concrete.

The slaughter-house floors are constructed in hard grooved flags with a central channel emptying at the north side. The whole of the outlets and wastes here mentioned are then connected to a longitudinal channel running the full length of the slaughter-house buildings. This empties into a specially prepared catch pit, where the sewage is treated before being connected to the drains.

No part of the slaughter-house open drainage is connected with the public sewer. The only covered drains on the site are those connected to the rain water pipes.

A trolley railway is provided in the rear of slaughter-houses for the purpose of conveying materials to any part.

The walls throughout this section are in white glazed bricks, and the ceilings are in cement.

In connection with the beast slaughter-houses, a special slaughter-house for pigs has been provided, measuring 23 ft. 5 in. by 17 ft. 3 in.

This is fitted up in similar manner to the beast slaughter-houses, with the most modern overhead gearing and machinery, and is in direct communication with the pig lairs, which come under the men's mess room. These slaughter-houses are in white glazed bricks with boarded top and flagged floor.

Tripery, Blood, and Gut Rooms.—Directly in the rear of the slaughter-house buildings, and in direct communication with the north entrance, a continuous block of buildings is placed, for the preparation of tripe.

The tripery is fitted up with the most modern machinery, in the form of jacketed pans, boiling pans, steeping tanks, for the treatment of tripe, ropes, etc. The steam for this section is conveyed from the boiler house.

The gut room is fitted with hardwood tables for the gut treatment, and is supplied with hot and cold water.

The blood room is arranged for the treatment of blood by the settling zinc system.

These floors are in concrete, and the walls are in white bricks.

Basement.—Under the site of the meat market, a basement 15 ft. 4 in. deep from floor to ceiling, is provided. This is made perfectly watertight, with specially prepared walls. The floor is in concrete and the ceiling in cement, and this forms the ground floor of the meat market.

This space is suitable for either cold stores, chill rooms, or general stores. The approaches from each end are by means of spacious staircases, and in addition to this, hydraulic hoists are provided.

Remainder of Buildings and General Grouping.—In the rear of the site, and in connection with the pig slaughter-house, is the men's mess room, 19 ft. 7 in by 16 ft. 7 in., with cistern room over, and adjoining is the boiler house and engine house.

The whole of the conveniences are placed under the gangway, and consist of general conveniences, and private conveniences for stall-holders.

The manure pit is placed under the same part.

The roads and yards throughout are paved with wood block floor, and Bolton Wood setts.

In constructing these buildings, wherever possible, glazed bricks have been used, wood-work omitted, and non porous hard materials substituted, on account of the rough usage which this class of buildings have to undergo.

LLANDUDNO.

The abattoirs have been built near the railway station, and have been arranged in such a position that they have the best possible access from the cattle siding. The London and North-Western Railway Company have met the Council to the extent of fixing a gate, so that the cattle arriving by train will pass directly to the slaughter-houses, thus obviating the necessity of allowing the cattle to enter the town. In order to meet the wishes of the local butchers, the Council have erected in the same block four private slaughter-houses and one public one. Each private slaughter-house consists of lairage, and slaughtering accommodation, and hanging rooms. The paving in the lairage and hanging rooms are of granolithic stone, and in the slaughter-houses of York flagging. The areas of the abattoirs may be gathered from the fact that the largest private slaughter-house consists of a

lairage, sixty square yards; slaughter-house fifty-two square yards; and cooling room, fifty-eight square yards; and the smallest private one of lairage, forty square yards; slaughter-house, forty square yards; and hanging room, forty square yards. The public slaughter-houses are so arranged that they can be converted into two private ones, and the ground at present not utilised can be laid out for the purposes of a public abattoir. The present public slaughter-houses consist of lairages—area, seventy-five square yards; slaughter-houses, eighty-two square yards; and hanging room, eighty-five square yards; and in addition there are, a workshop, office, and boiler house. The premises are supplied with cold water, and hot water can be obtained in any part of the building. Specially constructed catchpits have been made with a view to prevent blocking. The buildings are lighted by electricity.

St. Helens.

The abattoirs were erected by the Corporation in 1895, at a cost of £5000. The buildings are of grey bricks with Ruabon facings. The inside of the lairages and sheep and pig-pens are faced with brown glazed bricks, and the slaughter-houses for cattle and pigs and cooling-house with white glazed bricks, to a height of 6 ft. 0 in. above ground. The floors are constructed of granolithic paving, with the exception of the slaughter-houses for cattle and pigs, which are laid with 3 in. Haslingden flags. Lairage accommodation is provided for 100 beasts, 120 sheep, and 150 pigs. The cooling room, 80 ft. 0 in. by 30 ft. 0 in., will hold 120 carcases of beasts and 200 carcases of sheep, and is used as a wholesale market at certain hours of the day. A separate slaughter-house and cooling room is provided for the slaughtering of pigs. A railway siding runs directly into the abattoirs, with an unloading stage for cattle.

In connection with the abattoirs a refrigerating plant, to chill and freeze meat, fish, game, poultry, butter, etc., has recently been erected. There are three chilling rooms with a total capacity of 8000 cubic ft. and two freezing rooms with a total capacity of 3500 cubic ft. The system is on the ammonia compression principle, the plant being driven by an electric motor. The cost of the buildings and plant for the refrigerator was £2000. The abattoirs are very extensively used by the butchers of the town and district, notwithstanding the fact that there is no compulsion to kill in the place.

The following table shews the number of beasts, etc., killed in the Corporation slaughter-house and in the other slaughter-houses in the borough since the year 1895, when the public slaughter-house was established.

Year.	Corporation Abattoir.	Other Abattoirs.
1895	1226	2026
1896	1763	1634
1897	1973	879
1898	2465	623
1899	2682	734

The whole of the work has been carried out by Mr Geo. J. C. Broom, M. Inst. C.E., the borough engineer.

Southport.

The Corporation have erected a series of 14 slaughter-houses and 14 separate lairs for cattle and sheep, and have let off the exclusive use of 12 of the slaughter-houses to various butchers in the town reserving two of them for use by casual traders. They have also erected in connection with two special buildings for the use of gut scrapers. The slaughter-houses are served by a special railway siding connected to the Lancashire and Yorkshire Railway.

Withington.

This Council, 12 years ago, erected abattoirs at a cost of £3000, but they have not been occupied as such, as the butchers would not use them. They are now being used for other purposes.

West Hartlepool.

Buildings erected in 1895 at a cost of £6313, fittings £1009.

Abattoirs 1899.

Income.	£	s.	d.
Tolls— 4680 beasts @ 1/- - -	£234	0	0
7140 pigs @ 6d. - -	178	10	0
565 calves @ 5d. - -	11	15	5
13148 sheep @ 2½d. - -	136	19	2
	£561	4	7
Lairage - - - - - -	69	6	3
Sale of manure, etc. - - -	34	19	4
	£665	10	2
Expenditure.			
Interest and redemption of loan -	£452	10	0
Wages of Supt., Assts., etc. - -	304	11	10
Coal - - - - - - -	53	12	3
Gas - - - - - - -	17	3	5
Water - - - - - - -	72	18	8
Repairs - - - - - -	52	0	0
Rates - - - - - - -	59	4	0
Carts, etc. - - - - - -	63	0	0
Other expenses - - - - -	52	12	8
	£1127	12	10

The following statistics as to the revenue derived from twenty-five abattoirs is interesting as showing that abattoirs cannot always be relied upon to bring in a profit. That, however, is not everything.*

Town.	Cost. £ s. d.	Annual Revenue. £ s. d.	Annual Expenditure. £ s. d.	Annual Loss. £ s. d.
Accrington -	11,070 0 0	374 6 11	699 0 4	324 13 5
Ab'rgavenny	2,000 0 0 (not including land)	127 4 0	171 15 0	44 11 0
Birkenhead	11,598 10 1	391 0 0	880 6 0	489 6 0
Bolton - -	12,386 0 0	No details.	No details.	260 0 0
Brighton -	12,046 18 8 (not including land)	209 7 2	1,094 12 1	885 4 3
Burnley - -	11,500 0 0	928 5 3	1,106 5 3	178 0 0
Cardiff (2 abattoirs)	14,508 0 0	3,694 10 9	3,868 7 3	173 16 6
Carlisle - -	7,000 0 0 (not including land)	514 0 0	589 0 0	75 0 0
Cheltenham	2,172 3 9	No a/c's kept	No a/c's kept	Run at a loss
Croydon -	4,232 0 0	194 0 0	229 3 10	35 3 10
Darwen - -	4,732 0 0	308 0 0	441 0 0	133 0 0
Douglas (I. of Man)	4,500 0 0	215 0 0	454 2 6	239 2 6
Dublin - -	15,557 17 2	1,600 0 0	2,182 18 7	582 18 7
Edinburgh -	32,179 10 8	—	—	†568 16 9
Fleetwood -	475 0 0	80 0 0	110 0 0	30 0 0
Hanley - -	1,300 0 0	110 0 0	169 0 0	59 0 0

† Average loss for the years 1895-8.

*Quoted from a pamphlet entitled "Private Slaughter-houses *v.* Public Abattoirs." Published by Meat Trades' Journal Company, London.

Town.	Cost.	Annual Revenue.	Annual Expenditure.	Annual Loss.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Huddersfi'ld	15,347 0 0	765 15 6	5,036 15 7	4,271 0 1
Ilfracombe -	960 0 0	12 0 0	56 2 5	44 2 5
Kendal - -	Not given.	133 1 7	243 14 10	110 13 3
Leeds - -	3,000 0 0 (upwards of, without land).	32 11 5	Unknown.	Unknown.
Moss Side -	1,105 0 0 (without land).	80 0 0	86 18 6	6 18 6
Rugby - -	400 0 0	38 2 3	57 7 3	19 5 0
St. Helens -	5,000 0 0	210 17 9	404 10 5	193 12 8
W.Hartlep'l	10,125 0 0	479 0 0	914 0 0	435 0 0
Worcester -	1,000 0 0	No details.	No details.	90 0 0

Model Bye-Laws for the Regulations of Slaughter-houses in the United Kingdom.

The Local Government Board issued in 1877 the following series of "Model Bye-Laws" which are still in existance, and the only laws which govern abattoirs in the United Kingdom.

Memorandum.

Section 169 of the Public Health Act 1875, (38 and 39 Vict. c. 55) enacts that "for the purpose of enabling any "Urban Authority to regulate slaughter-houses within "their district, the provisions of the Towns Improvement "Clauses Act, 1847, with respect to slaughter-houses, shall "be incorporated with this Act."

Of the incorporated provisions of the 10 and 11 Vict. c. 34, sec. 128 is in the following terms:

"The Commissioners [Urban Sanitary Authority] shall, "from time to time, by bye-laws . . . . make regulations "for the licensing, registering, and inspection of the . . . "slaughter-houses . . . . and preventing cruelty therein, "and for keeping the same in a cleanly and proper state, and "for removing filth at least once in every twenty-four hours, "and requiring them to be provided with a sufficient supply "of water; and they may impose pecuniary penalties on "persons breaking such bye-laws; provided that no such "penalty exceed for any one offence the sum of five pounds, "and in the case of a continuing nuisance the sum of ten "shillings for every day during which such nuisance shall be "continued after the conviction for the first offence."

By the next section (129), it is provided that "the justices "before whom any person is convicted of killing or dressing "any cattle contrary to the provisions of this or the special "Act [*i.e.*, the 38 and 39 Vict. c. 55], or of the non-obser-"vance of any of the bye-laws or regulations made by virtue "of this or the special Act, in addition to the penalty "imposed on such person under the authority of this or the "special Act, may suspend, for any period not exceeding "two months, the licence granted to such person under this "or the special Act, or in case such person be the owner or "proprietor of any registered slaughter-house . . . . may "forbid, for any period not exceeding two months, the "slaughtering of cattle therein; and such justices, upon "the conviction of any person for a second or other subse-"quent like offence, may, in addition to the penalty imposed "under the authority of this or the special Act, declare the "licence granted under this or the special Act revoked, or "if such person be the owner or proprietor of any registered "slaughter-house, may forbid absolutely the slaughtering of "cattle therein; and whenever the licence of any such "person is revoked as aforesaid, or whenever the slaugh-"tering of cattle in any registered slaughter house . . . . "is absolutely forbidden as aforesaid, the Commissioners may "refuse to grant any licence whatever to the person whose "licence has been so revoked, or on account of whose "default the slaughtering of cattle in any registered slaughter-"house has been forbidden."

Further by section 130 it is enacted that "every person "who during the period for which any such licence is "suspended, or after the same is revoked as aforesaid, "slaughters cattle in the slaughter-house . . . . to which "such licence relates, or otherwise uses such slaughter-house ". . . . or allows the same to be used as a slaughter-house ". . . . and every person who during the period that the "slaughtering of cattle in any such registered slaughter-house ". . . . is forbidden as aforesaid, or after such slaughtering "has been absolutely forbidden therein, slaughters any "cattle in any such registered slaughter house, shall be "liable to a penalty not exceeding five pounds for such "offence, and a further penalty of five pounds for every "day on which any such offence is committed after the "conviction for the first offence."

In connection with these provisions, and those relating to the licensing and registration of slaughter-houses, in sections 125–127, the attention of the Sanitary Authority should be directed to the judgment of the Court of Exchequer Chamber in the case of Anthony *v.* The Brecon Markets Company (26 L.T., N.S., 982).

With reference to that judgment, a few observations may here be introduced in illustration of the nature and extent of the powers of the Sanitary Authority with regard to slaughter-houses.

It will be seen that the provisions of the Towns improvement Clauses Act, 1847, incorporated with the Public Health Act, 1875, by section 169, recognise two classes of slaughter-houses, viz., slaughter-houses in use and occupation at the time of the passing of the "special Act," and slaughter-houses not in use and occupation at that time. To the former class the requirements as to registration in section 127 are specially applicable. To the latter class the provisions as to licensing in sections 125–126 have direct reference.

Both classes may apparently be regulated by bye-laws under section 128.

In framing a model series of bye-laws under that enactment, the Board have considered that the statutory terms do not warrant the extension of the scope of the bye-laws to regulations directly affecting the structure of the premises.

But as regards premises for which under section 126 the licence of the Sanitary Authority will be required, the Board have been advised that, in the exercise of the discretionary power of licensing which has been conferred upon the Sanitary Authority, the following rules as to site and structure should influence their decision upon each application for a licence:

1. The premises to be erected or to be used and occupied as a slaughter-house should not be within 100 feet of any dwelling-house; and the site should be such as to admit of free ventilation by direct communication with the external air on two sides at least of the slaughter-house.

2. Lairs for cattle in connection with the slaughter-house should not be within 100 feet of a dwelling-house.

3. The slaughter-house should not in any part be below the surface of the adjoining ground.

4. The approach to the slaughter-house should not be on an incline of more than one in four, and should not be through any dwelling-house or shop.

5. No room or loft should be constructed over the slaughter-house.

6. The slaughter-house should be provided with an adequate tank or other proper receptacle for water, so placed that the bottom shall not be less than six feet above the level of the floor of the slaughter house.

7. The slaughter-house should be provided with means of thorough ventilation.

8. The slaughter-house should be well paved with asphalte or concrete, and laid with proper slope and channel towards a gully, which should be properly trapped and covered with a grating, the bars of which should be not more than three-eights of an inch apart.

Provision for the effectual drainage of the slaughter-house should also be made.

9. The surface of the walls in the interior of the slaughter-house should be covered with hard, smooth, impervious material, to a sufficient height.

10. No water closet, privy, or cesspool should be constructed within the slaughter-house.

There should be no direct communication between the slaughter-house and any stable, water-closet, privy, or cesspool.

11. Every lair for cattle in connection with the slaughter-house should be properly paved, drained, and ventilated.

No habitable room should be constructed over any lair.

JOHN LAMBERT,
Local Government Board, Secretary.
25th July 1877.

Bye-Laws with respect to Slaughter-houses.

For the licensing, registering and inspection of slaughter-houses, for preventing cruelty therein, for keeping the same in a cleanly and proper state, for removing filth at least once in every twenty-four hours, and requiring such slaughter-houses to be provided with a sufficient supply of water.

1. Every person who shall apply to the Sanitary Authority for a licence for the erection of any premises to be used and occupied as a slaughter-house shall furnish in the form hereunto appended a true statement of the particulars therein required to be specified.

Form of Application for a Licence to erect premises for use and occupation as a Slaughter-house.

To the Sanitary Authority for the District of .

I, , of , do hereby apply to you for a licence, in pursuance of the statutory provisions in that behalf, for the erection of certain premises to be used and occupied as a slaughter-house; and I do hereby declare that to the best of my knowledge and belief the Schedule hereunto annexed contains a true statement of the several particulars therein set forth with respect to the said premises.

Schedule.

1. Boundaries, area, and description of the proposed site of the premises to be erected for use and occupation as a slaughter-house.	
2. Description of the premises to be erected on such site: (*a*) Nature, position, form, superficial area and cubical contents of the several buildings therein comprised. (*b*) Extent of paved area in such buildings, and materials to be employed in the paving of such area. (*c*) Mode of construction of the internal surface of the walls of such buildings, and materials to be employed in such construction. (*d*) Means of water supply,—position, form, materials, mode of construction and capacity of the several cisterns, tanks, or other receptacles for water to be constructed for permanent use in or upon the premises. (*e*) Means of drainage,—position, size, materials, and mode of construction of the several drains. (*f*) Means of lighting and ventilation. (*g*) Means of access for cattle from the nearest street or public thoroughfare. (*h*) Number, position, and dimensions of the several stalls, pens, or lairs to be provided on the premises. (*i*) Number of animals for which accommodation will be provided in such stalls, pens, or lairs, distinguishing— 1. Oxen. 2. Calves. 3. Sheep or lambs. 4. Swine.	

Witness my hand this day of 19 .

(*Signature of Applicant*).

(*Address of Applicant*).

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2. Every person who shall apply to the Sanitary Authority for a licence for the use and occupation of any premises as a slaughter-house shall furnish in the form hereunto appended a true statement of the particulars therein required to be specified.

Form of Application for a Licence for the use and occupation of premises as a Slaughter-house.

To the Sanitary Authority for the District of .

I, , of , do hereby apply to you for a licence, in pursuance of the statutory provisions in that behalf, for the use and occupation as a slaughter-house of the premises hereinafter described; and I do hereby declare that to the best of my knowledge and belief the Schedule hereunto annexed contains a true statement of the several particulars therein set forth with respect to the said premises.

Schedule.

1. Situation and boundaries of the premises to be used and occupied as a slaughter-house.	
2. Christian name, surname, and address of the owner of the premises.	
3. Nature and conditions of applicant's tenure of the premises (*a*) For what term, and whether by lease or otherwise. (*b*) Whether applicant is sole owner, lessee, or tenant; or whether applicant is jointly interested with any other person or persons, and if so, with whom.	

4. Description of the premises :	
(*a*) Nature, position, form, superficial area, and cubical contents of the several buildings therein comprised.	
(*b*) Extent of paved area in such buildings, and materials employed in the paving of such area.	
(*c*) Mode of construction of the internal surface of the walls of such buildings and materials employed in such construction.	
(*d*) Means of water supply,—position, form, materials, mode of construction and capacity of the several cisterns, tanks, or receptacles for water, constructed for permanent use in or upon the premises.	
(*e*) Means of drainage,—position, size, materials, and mode of construction of the several drains.	
(*f*) Means of lighting and ventilation.	
(*g*) Means of access for cattle from the nearest street or public thoroughfare.	
(*h*) Number, position, and dimensions of the several stalls, pens, or lairs provided on the premises.	
(*i*) Number of animals for which accommodation will be provided in such stalls, pens, or lairs, distinguishing— 1. Oxen. 2. Calves. 3. Sheep or lambs. 4. Swine.	

Witness my hand this day of 19 .

(*Signature of Applicant*).

(*Address of Applicant*).

3. Every person to whom the Sanitary Authority may have resolved that a licence be granted to erect premises for use and occupation as a slaughter-house shall be entitled to receive from the Sanitary Authority a licence in the form hereunto appended, or to the like effect.

Form of Licence to erect premises for use and occupation as a Slaughter-house.

No. of Licence } ———

Reference to Folio in Register { ———

District of .

Whereas application has been made to us, the Sanitary Authority for the district of , by , of , , for a licence to erect on a site within the said district certain premises for use and occupation as a slaughter-house :

Now we, the said Sanitary Authority, in pursuance of the powers conferred upon us by the statutory provisions in that behalf, do hereby license the said , of , , to erect for use and occupation as a slaughter-house upon the site defined or described in the Schedule hereunto annexed the premises whereof the description is set forth in the said Schedule.

Schedule.

Boundaries, area, and description of the proposed site of the premises to be erected for use and occupation as a slaughter-house.	Description of the premises to be erected for use and occupation as a slaughter-house.

(L.S.) Given under the Common Seal of the Sanitary Authority for the district of , this day of , in the year One thousand nine hundred and .

Clerk to the Sanitary Authority.

4. Every person to whom the Sanitary Authority may have resolved that a licence be granted for the use and occupation of any premises as a slaughter-house shall be entitled to receive from the Sanitary Authority a licence in the form hereunto appended, or to the like effect.

Form of Licence for the use and occupation of premises as a Slaughter-house.

No. of Licence } ———

Reference to Folio in Register } ———

District of .

Whereas application has been made to us, the Sanitary Authority for the district of , by , of , , for a licence for the use and occupation of certain premises as a slaughter-house :

Now, we, the said Sanitary Authority, in pursuance of the powers conferred upon us by the statutory provisions in that behalf, do hereby license the said , of , , to use and occupy as a slaughter-house the premises whereof the situation and description are set forth in the Schedule hereunto annexed.

Schedule.

Situation of the premises to be used and occupied as a slaughter-house.	Description of the premises to be used and occupied as a slaughter-house.

(L.S.) Given under the Common Seal of the Sanitary Authority for the district of , this day of , in the year One thousand nine hundred and .

Clerk to the Sanitary Authority.

5. Every person who may have obtained from the Sanitary Authority, in accordance with the provisions of the bye-law in that behalf, a licence to erect any premises for use and occupation as a slaughter-house, or a licence for the use and occupation of any premises as a slaughter-house, shall register such premises at the office of the Sanitary Authority.

He shall, for such purpose, apply, by notice in writing addressed to the clerk to the Sanitary Authority, to register such premises; and thereupon it shall be the duty of the clerk to the Sanitary Authority, within a reasonable time after the receipt of such notice in writing, to enter in a book to be provided by the Sanitary Authority in the form hereunto appended the particulars therein required to be specified.

Form of Register of Slaughter-houses.

District of .

Folio .

Date of registration.	Date of licence.	No. of licence.	Christian name, surname, and address of owner or proprietor of slaughter-house.	Christian name, surname, and address of occupier of slaughter-house.	Situation of slaughter-house.	Number of animals for which accommodation is provided on the premises.			

6. Every occupier of a slaughter-house shall, at all reasonable times, afford free access to every part of the premises to the Medical Officer of Health, the Inspector of Nuisances, or the Surveyor of the Sanitary Authority, or to any committee specially appointed by the Sanitary Authority in that behalf, for the purpose of inspecting such premises.

7. Every occupier of a slaughter-house shall cause every animal brought to such slaughter-house for the purpose of being slaughtered, and confined in any pound, stall, pen, or lair upon the premises previously to being slaughtered, to be provided during such confinement with a sufficient quantity of wholesome water.

8. Every occupier of a slaughter-house and every servant of such occupier and every other person employed upon the premises in the slaughtering of cattle shall, before proceeding to slaughter any bull, ox, cow, heifer, or steer, cause the head of such animal to be securely fastened so as to enable such animal to be felled with as little pain or suffering as practicable, and shall in the process of slaughtering any animal use such instruments and appliances and adopt such method of slaughtering and otherwise take such precautions as may be requisite to secure the infliction of as little pain or suffering as practicable.

9. Every occupier of a slaughter-house shall cause the means of ventilation provided in or in connexion with such slaughter-house to be kept at all times in proper order and efficient action; and so that the ventilation shall be by direct communication with the external air.

10. Every occupier of a slaughter-house shall cause the drainage provided in, or in connexion with, such slaughter-house to be kept at all times in proper order and efficient action.

11. Every occupier of a slaughter-house shall cause every part of the internal surface of the walls and every part of the floor or pavement of such slaughter-house to be kept at all times in good order and repair, so as to prevent the absorption therein of any blood or liquid refuse or filth which may be spilled or splashed thereon, or any offensive or noxious matter which may be deposited thereon or brought in contact therewith.

He shall cause every part of the internal surface above the floor or pavement of such slaughter-house to be thoroughly washed with hot lime-wash at least four times in every year; that is to say, at least once during the periods between the *first* and *tenth* of *March*, the *first* and *tenth* of *June*, the *first* and *tenth* of *September*, and the *first* and *tenth* of *December* respectively.

He shall cause every part of the floor or pavement of such slaughter-house, and every part of the internal surface of every wall on which any blood or liquid refuse or filth may have been spilled or splashed, or with which any offensive or noxious matter may have been brought in contact during the process of slaughtering or dressing in such slaughter-house, to be thoroughly washed and cleansed within three hours after the completion of such slaughtering or dressing.

12. An occupier of a slaughter-house shall not at any time keep any dog, or cause or suffer any dog to be kept in such slaughter-house.

He shall not at any time keep, or cause or suffer to be kept in such slaughter-house any animal of which the flesh may be used for the food of man, unless such animal be so kept in preparation for the slaughtering thereof upon the premises.

He shall not at any time keep any cattle, or cause or suffer any cattle to be kept in such slaughter-house for a longer period than may be necessary for the purpose of preparing such cattle, whether by fasting or otherwise, for the process of slaughtering.

If, at any time, he keep, or suffer to be kept in such slaughter-house any cattle for the purpose of preparation, whether by fasting or otherwise, for the process of slaughtering, he shall not cause or suffer such cattle to be confined elsewhere than in the pounds, stalls, pens or lairs provided on the premises.

13. Every occupier of a slaughter-house shall cause the hide or skin, fat, and offal of every animal slaughtered on the premises to be removed therefrom within twenty-four hours after the completion of the slaughtering of such animal.

14. Every occupier of a slaughter-house shall cause the means of water supply provided in or in connexion with such slaughter-house to be kept, at all times, in proper order and efficient action, and shall provide for use on the premises a sufficient supply of water for the purpose of thoroughly washing and cleansing the floor or pavement, every part of the internal surface of every wall of such slaughter-house, and every vessel or receptacle which may be used for the collection and the removal from such slaughter-house of any blood, manure, garbage, filth, or other refuse products of the slaughtering of any cattle or the dressing of any carcase on the premises.

15. Every occupier of a slaughter-house shall provide a sufficient number of vessels or receptacles, properly constructed of galvanized iron or other non-absorbent material, and furnished with closely fitting covers, for the purpose of receiving and conveying from such slaughter-house all blood, manure, garbage, filth, or other refuse products of the slaughtering of any cattle or the dressing of any carcase on the premises.

He shall forthwith on the completion of the slaughtering of any cattle or the dressing of any carcase in such slaughter-house cause such blood, manure, garbage, filth, or other refuse products to be collected and deposited in such vessels or receptacles, and shall cause all the contents of such vessels or receptacles to be removed from the premises at least once in every twenty-four hours.

He shall cause every such vessel or receptacle to be thoroughly cleansed immediately after such vessel or receptacle shall have been used for such collection and removal, and shall cause every such vessel or receptacle when not in actual use to be kept thoroughly clean.

16. Every person who shall offend against any of the foregoing bye-laws for the registering and inspection of slaughter-houses, for preventing cruelty therein, for keeping the same in a cleanly and proper state, for removing filth at least once in every twenty-four hours, and for requiring such slaughter-houses to be provided with a sufficient supply of water, shall be liable for each such offence to a penalty of *five* pounds, and in the case of a continuing nuisance to a penalty of *ten* shillings for every day during which such nuisance shall be continued after the conviction for the first offence:

Provided nevertheless, that the justices or court before whom any complaint may be made or any proceedings may be taken in respect of any such offence may, if they think fit, adjudge the payment as a penalty of any sum less than the full amount of the penalty imposed by this bye-law.

Bye-Laws and Regulations with respect to Slaughter-houses and Knackers' Yards (City of Dublin).

The form which bye-laws governing an abattoir may take depends to a large extent on local conditions. As an example of what might be followed with advantage, we have chosen the Bye-laws of the City of Dublin, which are as follows:—

For the licensing, registering, and inspection of slaughter-houses; for preventing cruelty therein; for keeping the same in a cleanly and proper state; for removing filth at least once in every twenty-four hours, and requiring such slaughter-houses to be provided with a sufficient supply of water; and with regard to the conveyance of carcases through public streets.

1. Every person intending or desiring to occupy, erect, build, keep, take, or open any building to be used as a slaughter-house or knacker's yard, and every occupier of any place or building used as a slaughter-house or knacker's yard within the City of Dublin, which was not in such use and occupation on the 31st day of March 1899, shall make application in writing for a licence for the erection, use, or occupation thereof, and in the form or to the effect contained in the Schedule marked A, to these Bye-laws annexed, and such application shall be lodged, and served at the office of the Executive Sanitary Officer, Public Health Committee Office, 17 Castle Street, or wherever hereafter such office may be situated.

2. No person, after the 22nd March 1899, and after one week's notice by the Executive Sanitary Officer, shall, without being duly registered, occupy, use, or suffer to be used, any such place or building as a slaughter-house or knacker's yard.

3. No occupier of a slaughter-house or knacker's yard shall, at any time after the date of the registration of his slaughter-house or knacker's yard, without the assent in writing of the Executive Sanitary Officer, or other authorised officer of the Corporation, make any change or alteration whatsoever, or permit or suffer any change or alteration whatsoever to be made in the slaughter-house, or building, or knacker's yard, so registered or licensed (as the case may be), in respect of the drainage of the same; or,

In respect of the flagging of the same; or

In respect of the ventilation of the same; or

In respect of the supply of water to the same.

4. Every person who shall apply to the Sanitary Authority for a licence for the erection of any premises to be used and occupied as a slaughter-house, or for a licence to use any premises for such purpose, shall give notice of his intention in at least two morning papers, in the form and to the effect contained in the Schedule marked A to these Bye-laws annexed, and post on the premises notice of his intention to apply at least one fortnight before making such application.

5. Every person who shall apply to the Sanitary Authority for a licence for the erection or conversion of any premises to be used and occupied as a slaughter-house, shall furnish, in the form in Schedule A hereunto appended, a true statement of the particulars therein required to be specified.

Every person to whom the Sanitary Authority may have resolved that a licence be granted to erect or convert premises for use and occupation as a slaughter-house, shall be entitled to receive from the Sanitary Authority a licence in the form in the Schedule B hereunto appended, or to the like effect.

Every person to whom the Sanitary Authority may have resolved that a licence be granted for the use and occupation of any premises as a slaughter-house shall be entitled to receive from the Sanitary Authority a licence in the form in the Schedule C hereunto appended, or to the like effect.

He shall, for such purpose, apply, by notice in writing, addressed to the Executive Sanitary Officer, to register such premises; and thereupon it shall be the duty of the Executive Sanitary Officer, within a reasonable time after the receipt of such notice in writing, to enter in a book to be provided by the Sanitary Authority, in the form in Schedule E hereunto appended, the particulars therein required to be specified.

Every person who may have obtained from the Sanitary Authority, in accordance with the provisions of the Bye-law in that behalf, a licence to erect or convert any premises for use and occupation as a slaughter-house, or a licence for the use and occupation of any premises as a slaughter-house, shall register such premises at the office of the Sanitary Authority, and shall renew such registration as often as such licence is renewed.

That every occupier of a registered or licensed slaughter-house shall cause the word "slaughter-house," and every occupier of a knacker's yard shall cause the word "knacker's yard," together with the number corresponding with the number of his licence or register, as the occupier of such slaughter-house or knacker's yard, as the same shall appear from time to time in the registry of slaughter-houses or knackers' yards, kept under the directions of the said Council, to be painted or otherwise inscribed to the satisfaction of the Inspector of Nuisances or other authorised officer for the time being, on, over, or adjoining to the outside of the door or entrance to such slaughter-house or knacker's yard, and kept and continued there, not obliterated or defaced.

6. Every occupier of a slaughter-house shall at all reasonable times, and also at any time, whether by day or night,

when any persons may be occupied within them, afford free access to every part of the premises to the Superintendent Medical Officer of Health, the Medical Officer of Health, the Executive Sanitary Officer, the Inspector of Slaughter-houses, Sanitary Sub-Officer, or other officer of the Sanitary Authority, or to any committee specially appointed by the Sanitary Authority in that behalf for the purpose of inspecting such premises.

7. Every occupier of a slaughter-house shall cause every animal brought to such slaughter-house for the purpose of being slaughtered, and confined in any pound, stall, pen, or lair upon the premises previously to being slaughtered, to be provided during such confinement with a sufficient quantity of wholesome water, and (if kept confined for more than twelve hours) food.

8. Every occupier of a slaughter-house, and every servant of such occupier, and every other person employed upon the premises in the slaughtering of cattle shall, before proceeding to slaughter any bull, ox, cow, heifer, or steer, cause the head of such animal to be securely fastened so as to enable such animal to be felled with as little pain or suffering as practicable, and shall, in the process of slaughtering any animal, use such instruments and appliances, and adopt such method of slaughtering, and otherwise take such precautions as may be requisite to secure the infliction of as little pain or suffering as practicable.

9. Every occupier of a slaughter-house shall, with respect to the least painful mode of killing animals, observe so far as practicable any directions for the purpose of carrying out that object issued by the Sanitary Authority.

10. Every occupier of a slaughter-house shall cause the means of ventilation, provided in, or in connection with such slaughter-house, to be kept at all times in proper order and efficient action, and so that the ventilation shall be by direct communication with the external air.

11. Every occupier of a slaughter-house shall cause the drainage, provided in, or in connection with such slaughter-house, to be kept at all times in proper order and efficient action.

12. Every occupier of a slaughter-house shall cause the slaughtering-chamber floor to be laid with 1½ inch thick of good asphalte over 6½ inches of concrete, or with 7 inches concrete containing 80 per cent. of cement. The walls to be finished and faced to a height of at least 4 feet above the floor with Portland cement or glazed bricks. Both floor and walls to be at all times maintained in good order and repair, so as to prevent the absorption of any liquid.

13. Every occupier of a slaughter-house shall cause the floors of the lairs, and all other portions of the premises accessible to animals, to be laid with squared paving setts, grouted with tar asphalte, or laid in concrete formed of some impervious material, so as to prevent the absorption of any liquid matter or filth; these floors are at all times to be maintained in good order and repair.

14. Every occupier of a slaughter-house shall cause every part of the internal surface above the floor or pavement of such slaughter-house to be thoroughly washed with hot lime-wash, at least once every month.

Every occupier of a slaughter-house shall cause every part of the floor or pavement of such slaughter-house, and every part of the internal surface of every wall on which any blood or liquid refuse or filth may have been spilled or splashed, or with which any offensive or noxious matter may have been brought in contact during the process of slaughtering or dressing in such slaughter-house, to be thoroughly washed and cleansed within six hours after the completion of such slaughtering or dressing.

15. No occupier of a slaughter-house shall at any time keep any dog, or cause or suffer any dog to be kept in such slaughter-house.

16. No occupier of a slaughter-house shall at any time keep, or cause or suffer to be kept in such slaughter-house, any animal of which the flesh may be used for the food of man, unless such animal be so kept in preparation for the slaughtering thereof upon the premises.

17. No occupier of a slaughter-house shall at any time keep any cattle, or cause or suffer any cattle to be kept in such slaughter-house for a longer period than may be necessary for the purpose of preparing such cattle, whether by fasting or otherwise, for the process of slaughtering.

If at any time he keep, or suffer to be kept in such slaughter-house, any cattle for the purpose of preparation, whether by fasting or otherwise, for the process of slaughtering, he shall not cause or suffer such cattle to be confined elsewhere than in the pounds, stalls, pens, or lairs provided on the premises.

18. Every occupier of a slaughter-house shall cause the hide or skin, fat, and offal of every animal slaughtered on the premises to be removed therefrom within twenty-four hours after the completion of the slaughtering of such animal.

19. Every occupier of a slaughter-house shall cause the means of water supply, provided in, or in connection with such slaughter-house, to be kept at all times in proper order and efficient action, and shall provide for use on the premises a sufficient supply of water for the purpose of thoroughly washing and cleansing the floor or pavement, every part of the internal surface of every wall of such slaughter-house, and every vessel or receptacle which may be used for the collection and removal from such slaughter-house of any blood, manure, garbage, filth, or other refuse products of the slaughtering of any cattle, or the dressing of any carcase on the premises.

20. Every occupier of a slaughter-house shall provide a sufficient number of vessels or receptacles, properly constructed of galvanised iron or other non-absorbent material, and furnished with closely-fitting covers, for the purpose of receiving and containing all blood, manure, garbage, filth, or other refuse products of the slaughtering of any cattle, or the dressing of any carcase on the premises. The blood shall not be allowed to flow into the sewer.

He shall forthwith upon the completion of the slaughtering of any cattle or the dressing of any carcase in such slaughter-house cause such blood, manure, garbage, filth, or other refuse products to be collected and deposited in such vessels or receptacles, and shall cause all the contents of such vessels or receptacles to be removed from the premises at least once in every forty-eight hours, or more frequently if desired by a medical officer of health.

He shall cause every such vessel or receptacle to be thoroughly cleansed immediately after such vessel or receptacle shall have been used for such collection and removal, and shall cause every such vessel or receptacle when not in actual use to be kept thoroughly clean.

Any pit used for the reception of manure or offal shall be constructed of impervious materials.

21. Every carcase, or portion of a carcase, of meat conveyed through the public thoroughfares shall be conveyed in

a properly constructed cart, or other suitable vehicle, and shall be properly covered and not exposed to view.

22. Any person conveying, or causing to be conveyed, offal, hide, or skin through the public thoroughfares, shall do so in a properly constructed cart, or other suitable vehicle, and no person shall carry, or cause to be carried, any carcase, or a portion of a carcase, hide, skin, or offal along the public footways.

23. There shall be provided a water hose, with which the slaughter-house shall be thoroughly washed at least once every day that it is used.

24. No water-closet, privy, or cesspool shall be constructed within any slaughter-house.

25. That every occupier of a slaughter-house shall cause a copy of these Bye-laws, written or printed in large characters, to be affixed in some conspicuous place in such slaughter-house, to the satisfaction of the Inspector of Nuisances, or other authorised officer for the time being, and to be at all times kept and continued there, not obliterated or defaced.

26. Every person who shall offend against any of the foregoing Bye-laws shall be liable for every such offence to a penalty of *five* pounds, and in the case of a continuing nuisance to a penalty of *ten* shillings for every day during which such nuisance shall be continued after the conviction for the first offence.

Provided, nevertheless, that the Justices or Court before whom any complaint may be made, or any proceedings may be taken in respect of any such offence, may, if they think fit, adjudge the payment as a penalty of any sum less than the full amount of the penalty imposed by this Bye-law.

The Sanitary Authority shall keep a proper register of all licensed slaughter-houses, and register all additional licences or revocations of licences.

SCHEDULE A.

Form of Application for a Licence to erect or convert premises for use and occupation as a Slaughter-house.

To the Executive Sanitary Officer of the Sanitary Authority for the District of the City of Dublin.

I , of , ,
do hereby apply to you for a licence, in pursuance of the statutory provisions in that behalf, for the use and occupation as a slaughter-house of the premises hereinafter described; and I do hereby declare that to the best of my knowledge and belief the Schedule hereunto annexed contains a true statement of the several particulars therein set forth with respect to the said premises, and that I am to be considered and held to be the occupier of said premises for all purposes and in all legal and other proceedings relating thereto.

Schedule.

1. Situation and boundaries of the premises to be used and occupied as a slaughter-house.	
2. Christian name, surname, and address of the owner of the premises.	
3. Nature and condition of applicant's tenure of the premises. (*a*) For what term; and whether by lease or otherwise. (*b*) Whether applicant is sole owner, lessee, or tenant; or whether applicant is jointly interested with any other person or persons, and if so, with whom.	
4. Description of the premises or proposed premises: (*a*) Nature, position, form, superficial area, and cubical contents of the several buildings therein comprised. (*b*) Extent of paved area in such buildings, and materials employed in the paving of such area. (*c*) Mode of construction of the internal surface of the walls of such buildings, and materials employed in such construction. (*d*) Means of water supply—position, form, materials, mode of construction and capacity of the several cisterns, tanks, or receptacles for water, constructed for permanent use in or upon the premises. (*e*) Means of drainage—position, size, materials, and mode of construction of the several drains. (*f*) Means of lighting and ventilation. (*g*) Means of access for cattle from the nearest street or public thoroughfare. (*h*) Number, position, and dimensions of the several stalls, pens, or lairs provided on the premises. (*i*) Size of yard. (*j*) Number of animals for which accommodation will be provided in such stalls, pens, or lairs, distinguishing— 1. Oxen. 2. Calves. 3. Sheep or lambs. 4. Swine.	

Witness my hand this day of 190 .

Signature of Applicant.

Address of Applicant.

SCHEDULE B.

Form of Licence to erect or convert premises for use and occupation as a Slaughter-house.

No. of Licence } ———

Reference to Folio in Register } ———

District of the City of Dublin.

Whereas application has been made to us, the Sanitary Authority for the district of , by of , for a licence to erect or convert on a site within the said district certain premises for use and occupation as a slaughter-house:

Now, we, the said Sanitary Authority, in pursuance of the powers conferred upon us by the statutory provisions in that behalf, do hereby licence the said , of ,

as the occupier thereof within the meaning of the Bye-laws with respect to Slaughter-houses, made by us pursuant to "The Public Health (Ireland) Act, 1878," to for use and occupation as a slaughter-house upon the site defined or described in the Schedule hereunto annexed, the premises whereof the description is set forth in the said Schedule, and to use and occupy the same as a slaughter-house from the day of .

Schedule.

Boundaries, area, and description of the proposed site of the premises to be erected for use and occupation as a slaughter-house.	Description of the premises to be erected for use and occupation as a slaughter-house.

(L.S.) Given under the Common Seal of the Sanitary Authority for the district of the City of Dublin, this day of , in the year One thousand nine hundred and .

Executive Sanitary Officer.

SCHEDULE C.

Form of Licence for the use and occupation of premises as a Slaughter-house.

No. of Licence } ———

Reference to Folio in Register } ———

District of .

Whereas application has been made to us, the Sanitary Authority for the district of the City of Dublin, by of , for a licence for the use and occupation of certain premises as a slaughter-house:

Now, we, the said Sanitary Authority, in pursuance of the powers conferred upon us by the statutory provisions in that behalf, do hereby licence the said , of , as the occupier thereof within the meaning of the Bye-laws with respect to Slaughter-houses, made by us pursuant to "The Public Health (Ireland) Act, 1878," to use and occupy as a slaughter-house the premises whereof the situation and description are set forth in the Schedule hereunto annexed, and to use and occupy tbe same as a slaughter-house from the day of to the day of .

Schedule.

Situation of the premises to be used and occupied as a slaughter-house.	Description of the premises to be used and occupied as a slaughter-house.

(L.S.) Given under the Common Seal of the Sanitary Authority for the district of , this day of , in the year One thousand nine hundred and .

Executive Sanitary Officer.

SCHEDULE D.

Form of Register of Slaughter-houses.

District of .

Folio .

Date of registration.	Date of licence.	No. of licence.	Christian name, surname, and address of owner or proprietor of slaughter-house.	Christian name, surname, and address of occupier of slaughter-house.	Situation of slaughter-house.	Number of animals for which accommodation is provided on the premises.		

Sealed with the Common Seal of the Corporation of Dublin, this 26th day of January 1899.

HENRY CAMPBELL, *Town Clerk.*

Corporation Seal.

The foregoing Bye-laws confirmed by the Local Government Board for Ireland, this Twenty-second day of March 1899.

H. A. ROBINSON.
WM. L. MICKS.
T. J. STAFFORD.
R. BAGWELL.

Seal of the Local Government Board for Ireland.

The following regulations relative to the Paris abattoirs are about the most complete of their kind in existence.

"*Control of Abattoirs* (Regulations of the 28th of October, 1829; 25th March, 1830; 23rd October, 1854; Police Orders of the 29th August, 1879).

"It is forbidden to slaughter cattle and to dress the carcases in any other place than the abattoirs built and arranged for that purpose, which are under the supervision of the Prefecture of Police.

"Pigs affected with measles must not leave the abattoir. Beasts dying during transport, killed suddenly through accident in the market, the railroads, the public roads, or at the cattle breeders', must be taken to the nearest abattoir. An inspector will examine them and decide whether the meat is to be sold or destroyed.

"In all cases, the flesh of animals dying a natural death must be destroyed at the expense of the owner.

"No beast can be slaughtered in a stable or a yard, except in cases of extreme urgency, ascertained by the inspector.

"Calves and lambs dying a natural death must be destroyed in the slaughter-house itself, and not taken away from it on any pretext.

"Beasts suspected of disease — and, therefore, placed under observation in the stables of the abattoir—must only be slaughtered in the presence of an inspector, who must examine the viscera.

"Meat and offal must only be kept in the places appointed for that purpose. It is forbidden to withdraw them from inspection in any way whatever.

"The meat of slaughtered animals is examined, and what is judged to be bad is confiscated.

"In case of protest, the flesh and intestines of the animal are sent to a special place and examined by an expert. If the intestines are wanting, the protest is null and void.

"If no claim has been made at the end of twenty-four hours, the meat is destroyed at the cost of the owner.

"The meat seized or deposited with the inspectors is at their disposal, and must not be taken away or destroyed without an order from them.

"All attempts to deceive the buyer as to the quality of the commodities—as, for instance, by the blowing up of meat—are punishable by a fine.

"*Inspection of Meat.*—(Police Regulations of the 13th Oct., 1879).

"All fresh meat exceeding three kilogrammes weight in amount, and all salted or smoked meat more than five kilos in weight, must be inspected when it enters the city. For this purpose, inspection officers are placed at the gates of Saint Cloud, Ternes, Clichy, La Villette, Vincennes, Charenton, Italie, and Orleans.

"If it is desired to bring meat into Paris after the regular hours by other gates than the above-mentioned, by railroad or by boat, it may be done on condition that the meat be taken, at the expense of the bringer, to the nearest abattoir or to the Central Halls, under the escort of a Custom House official, where it will receive the regular inspection.

"Meat recognised as unfit for food is immediately seized and destroyed at the cost of the owner; but the latter has the right of appeal to the Court if he thinks the seizure illegal.

"If the owner of the condemned meat wishes to keep it for the manufacture of tallow, etc., he may obtain permission; but in that case the meat must be specially treated in the presence of the inspector, at the cost of the applicant. Numerous incisions are made in it; it is sprinkled with powdered charcoal and spirits of turpentine or ammonia.

"If the owner of the meat protests against the seizure, and demands another examination, the meat is taken to the office of inspection in the Central Halls, and is again examined by one of the veterinary surgeons in the service of the Prefecture of Police, designated by the owner himself. If the meat be confiscated, either wholly or in part, the cost of the examination must be borne by the owner.

"All meat—whether sold in slaughter-houses, markets, or butchers' shops—must be submitted to inspection. The same obligation is in force for the offal and the products of manufacture. This inspection must be made in every shop at least twice in the month.

"The inspectors of meat are also entrusted with the examination of poultry, game, and fish.

"A large number of private slaughter-houses were built in the outskirts of the city in consequence of the vigorous measures enforced in Paris. These have been placed under the supervision of ten special inspectors since 1883. Their jurisdiction extends over the whole of the Department of the Seine.

'*Central Halls.*—In Paris as in London, the wholesale traffic in provisions needing careful supervision is centred in one place, the Central Halls.

"At present the market covers a space of 40,390 square metres, but it will be shortly enlarged.

"There are ten pavilions connected by covered passages. They are arranged in two sections, one of four and another of six, separated by the wide Baltard Street. The pavilions and sections form a perfect square. Each pavilion is divided into a number of shops. Underground are store houses and cellars.

"The sections composed of four pavilions are at the left of Baltard Street. They are devoted to the sale of meat and offal, game, poultry, fruit and vegetables.

"The larger section of six pavilions is set apart for tubers, legumes, fish and shellfish, butter and cheese.

"The exchange is near the market. The wholesale traffic is conducted by brokers or auctioneers. It commences in winter at 6 a.m., in summer at 5 a.m., and ends at 9 a.m. A bell then announces the retail sale.

"The inspection of meat at the market is made in the following manner:—

"Each piece of meat is marked with a number hung on a hook, and then examined by the inspectors. The good pieces are marked with a V (à vendre), the doubtful are taken to a special room, there to receive a careful examination. After careful anatomical and microscopical investigation, the inoffensive portions are returned, but all the damaged or diseased parts are condemned. The condemned meat is used for the food of the wild beasts in the Zoological Gardens, or else it is destroyed as before mentioned.

"After the Central Market, the market of St. Germain, near the Church of Saint Sulpice, is the largest place for the sale of general provisions. The market of Porte Saint Martin is principally for the sale of poultry.

"The display of merchandise is nowhere better understood than in Paris. Even the meat is garnished with flowers and foliage.

"*Condemned Meat: its Characteristics.*—The legal arrangements which form the basis for the inspection of meat in Paris are the articles 475, 477, and 479 of the Penal Code, besides the law of the 27th of March, 1851, in virtue of which the sale of adulterated or deleterious food is forbidden.

"The flesh of animals suffering from fever is easily recognised in the abattoirs, where the beasts are examined as they stand, and their internal organs after slaughter. But serious difficulties occur in forming judgment as to foreign meat. The points relied upon by the veterinary inspectors of Paris, whose scientific education is perfect, rest on observations carefully pursued during long years.

"These points are the following:—

"1. The meat is red, more or less dark, and of a dull tint.

"2. The abductor muscle of the thigh has a grey earthy or ochreish tint.

"3. The serous membranes of the abdomen and chest are furrowed with branchings of a leaden grey or livid colour produced by hypostatis.

"4. The suet and fat exhibit more or less vascular injection, giving them the appearance of being streaked with wine. At other times the fat has a peculiar colouring, like wax which has taken a smoky tint. This is noticed chiefly in the depression between the lumps of fat.

"5. A purplish discoloration of the loins. This sign is seldom wanting.

"6. The veins contain more or less blood.

"7. A brownish or blackish discoloration of the soft parts of the vertebrae when dissected.

"8. The muscular tissue is less firm.

"When one or other of the following indications is observed, the blood must be examined through a microscope:—

"If there is only a slight rosy vascular injection in the tissues beneath the skin, if the fat is white inside, the flesh firm, of good appearance, without infiltration or abnormal colour, the meat is passed.

"Any unpleasant odour shows that the meat is not in normal condition. Such odour will be most perceptible at the incision of the muscles, particularly the abductors of the thigh and of the leg, and the great muscle under the shoulder blade.

"Sometimes when a muscle of a dull brown or grey colour is cut, the section takes a pale red colour on exposure to the air, which remains even after cooking the meat.

"When this change of colour occurs, the section is covered with a glutinous serum. Bloody infiltrations of serum are also often noticed in the cellular tissue between the muscles.

"Another most important and common sign is, that in the change of colour many tints are assumed, so that the meat seems mottled. The dominant colours are pale rose, dark red, and grey. This last is seen chiefly at the edge of the muscles. It is in cutting the sartorius and pectoral muscles that these changes of colour are most noticeable.

"The bundles of muscles near the bones have a pale rose tint, while the others are dark rose.

"The presence of exudations in the lymphatic glands is also an important indication.

"As to tuberculosis, the rule is that if the lymphatic glands are affected, if dropsy is present, seizure is imperative. It is so also if the tuberculosis has caused emaciation. Otherwise, the parts invaded by tubercle only are condemned.

"Considering the difficulty in ascertaining the presence of tuberculosis merely by examination of the meat, it is ordered that the meat examined should be at least the size of one quarter, and that the lungs should be comprised in one of these pieces.

"There is no examination for the discovery of trichinosis in Paris. At the time when scientific interest was much excited on this subject, the inspectors made microscopic investigations; but as not one case of trichinosis was found after 3000 beasts had been examined, the researches have been abandoned. There is no reason to fear that disease in France, England, or Belgium, as the people do not eat raw pork."

Adulteration of Foods.—The Sale of Food and Drugs Act, 1899, is simply an Amending Act, and now forms one of four separate Acts, viz., The Sale of Food and Drugs Act, 1875; The Amending Act, 1879; The Margarine Act, 1887; and the Act of 1899.

Instead of codifying all the previous Acts and thus simplifying matters, the Government have only added more worry to traders, and given them four Acts to master instead of one.

Only two Sections of the Act are likely to affect the food trades, viz., 3 and 6.

Section 3 of the Act of 1875 enacts that—

"No person shall mix, colour, stain, or powder, or order "or permit any other person to mix, colour, stain, or powder "any article of food with any ingredient or material so as to "render the article injurious to health, with intent that the "same may be sold in that state, and no person shall sell "any such article so mixed, coloured, stained, or powdered "under a penalty in each case not exceeding fifty pounds for "the first offence: every offence after a conviction for a first "offence shall be a misdemeanour, for which the person on "conviction shall be imprisoned for a period not exceeding "six months with hard labour."

It will be noticed that this Section covers the use of preservatives, colours, etc., but while in the 1872 Act the offence was in using any ingredient which in itself was injurious to health, an important distinction is now made in that the ingredient used must render the article of food injurious to health. This section makes it imperative that the prosecuting parties or local authority should prove that the article is injurious to health. The Amending Act of 1899 gives the power to the Local Government Board or Board of Agriculture to act in default of the local authority in case the latter should be averse to instituting prosecutions, and the local authority can be compelled to appoint a public analyst.

The amending Section 3 is as follows:—

"(1) It shall be the duty of every local authority entrusted "with the execution of the laws relating to the sale of food "and drugs to appoint a public analyst, and put in force "from time to time, as occasion may arise, the powers with "which they are invested, so as to provide proper securities "for the sale of food and drugs in a pure and genuine con-"dition, and in particular to direct their officers to take "samples for analysis.

"(2) If the Local Government Board or Board of Agri-"culture, after communication with a local authority, are of "opinion that the local authority have failed to execute or "enforce any of the provisions of the Sale of Food and "Drugs Acts in relation to any article of food, and that "their failure affects the general interest of the consumer "or the general interests of agriculture in the United King-"dom, as the case may be, the Board concerned may, by "order, empower an officer of the Board to execute and "enforce those provisions or to procure the execution and "enforcement thereof in relation to any article of food men-"tioned in the order.

"(3) The expenses incurred by the Board or their officer "under any such order shall be treated as expenses incurred "by the local authority in the execution of the said Acts, "and shall be paid by the local authority to the Board on "demand, and in default the Board may recover the amount "of expenses with costs from the local authority.

"(4) For the purposes of this Section an order of the "Board shall be conclusive in respect of any default, amount "of expenses, or other matter therein stated or appearing.

"(5) Any public analyst appointed under the Sale of Food "and Drugs Acts shall furnish such proof of competency as "may from time to time be required by regulation framed "by the Local Government Board."

Local authorities, however, have preferred to prosecute under Section 6 of the Act of 1875, which reads as follows:—

"No person shall sell to the prejudice of the purchaser "any article of food or any drug which is not of the nature, "substance, and quality of the article demanded by such "purchaser, under a penalty not exceeding twenty pounds; "provided that an offence shall not be deemed to be com-"mitted under this Section in the following cases: that "is to say,

"(1) Where any matter or ingredient not injurious to health has been added to the food or drug because the same is required for the production or preparation thereof as an article of commerce, in a state fit for carriage or consumption and not fraudulently to increase the bulk, weight, or measure of the food or drug, or conceal the inferior quality thereof;

"(2) Where the drug or food is a proprietary medicine, or is the subject of a patent in force, and is supplied in the state required by the specification of the patent;

"(3) Where the food or drug is compounded as in this Act mentioned;

"(4) Where the food or drug is unavoidably mixed with some extraneous matter in the process of collection or preparation."

This section leaves a wide door for prosecution, as complaint can be made if the article sold is better than what is demanded, just as much as if it is inferior or different in any respect; and, of course, a technical offence is made in using salt or any other ingredient or preservative whatsoever in provisions unless it is plainly stated to contain same before the sale is made.

The Amending Section refers more to the Margarine Act of 1887, and reads:—

"(1) Where under this Act or the Margarine Act, 1887, "it is required that any package containing margarine or "margarine-cheese shall be branded or marked, the brand "or mark shall be on the package itself and not solely on "a label, ticket, or other thing atttached thereto (*a*).

"(2) The letters required to be printed on the paper "wrapper in which margarine or margarine-cheese is sold "shall be capital block letters not less than half an inch "long and distinctly legible, and no other printed matter "shall appear on the wrapper (*b*).

"(3) The words 'or with' in Section 6 of the Margarine "Act, 1887, shall be repealed (*c*)."

It should always be kept in mind that everything that is possible to read into an Act of Parliament will in the course of time be tried, and sellers of all kinds of provisions remain at the mercy of inspectors whose duties are unfortunately often construed by themselves to include all sorts of petty harassing of trade. Traders should, therefore, be scrupulous in carrying out, so far as they are able, the requirements of the Acts.

Agitator for Lard.—see Lard Agitator.

Alexander Meat Cutters. — These cutting machines are made for both hand and power, and are the best all round machines on the market. By an arrangement of different sized holed plates any kind of cut can be produced from large squares of fat for rendering, down to meat and bloater paste. The hand power machines vary in capacity from 60 lbs. to 300 lbs. per hour, but the popular machine for ordinary shop trade is the A. B. The power machines vary in capacity from 400 lbs. to 4000 lbs. per hour.

These machines are used by sausage makers, fat renderers, meat paste, margarine, fish paste, and sauce manufacturers, etc., etc. Bacon curers also use them for cutting up flake and mudgeon fats before rendering into lard, and it is claimed that by the use of the "Alexander" cutters the greave in lard is reduced to a minimum, while the lard itself is rendered quickly and uniform in texture and grain.

The principal on which these machines work is as follows:—The meat or fat, etc., is fed into the hopper and is caught by a spiral propeller, which carries the meat through the barrel and forces it against the plate; the pressure causes the meat to go through the holes and a four bladed knife which revolves on inside of plate cuts the meat as quickly as it comes forward, thus producing pieces the size of the holes in plate. The propeller is hollow and the knife spindle works through it; by an ingenious arrangement the knife is revolved at a much greater speed than the propeller, and the meat is cut with a scissors like clip thus preventing bruising, heating, or discolourisation.

The following points should be closely observed in fitting up these machines.

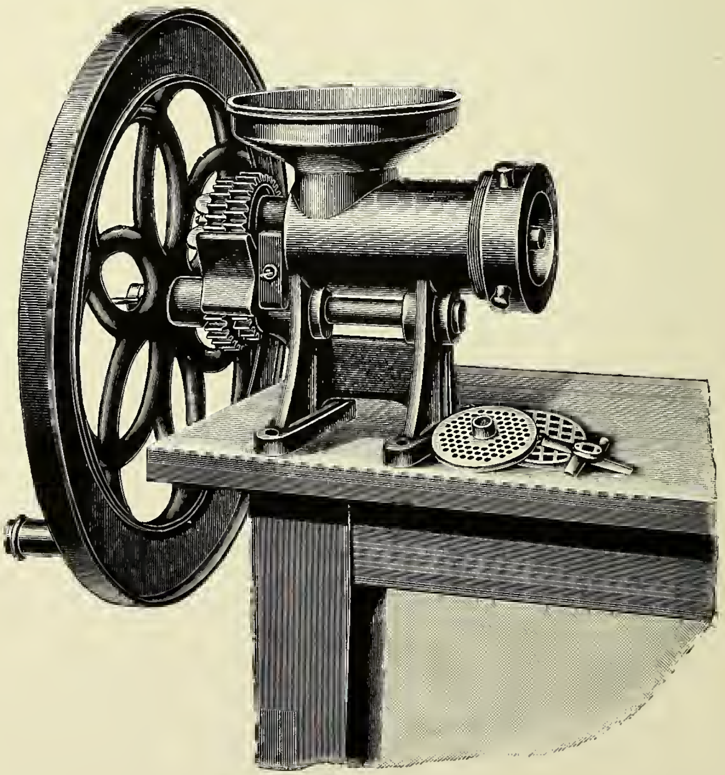
It is essential that the machine should be kept scrupulously clean, and for this purpose the propeller and spindle should be removed and washed with hot water, and the following directions observed in putting the machine together:—

1. The knife spindle should be oiled before putting it into propeller. All lubricating holes to be kept clean and filled with oil.

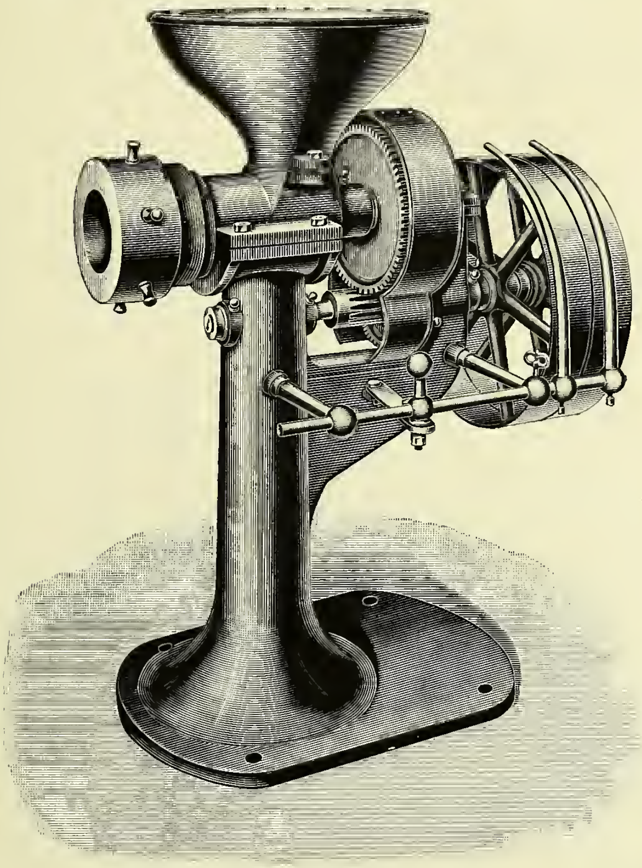
2. The strong knife is fitted on the knife spindle with the bevelled sides towards the propeller. Then place ½-inch or larger plate in position.

3. The flat knives are put in with the stars showing outwards, and plate with smaller holes according to cut required placed in front.

4. Screw on the ring moderately tight so as to press the knives sufficiently tight against the plates, but on no account



A. B. Alexander Meat Cutter.



F to H Alexander Meat Cutter for Power.

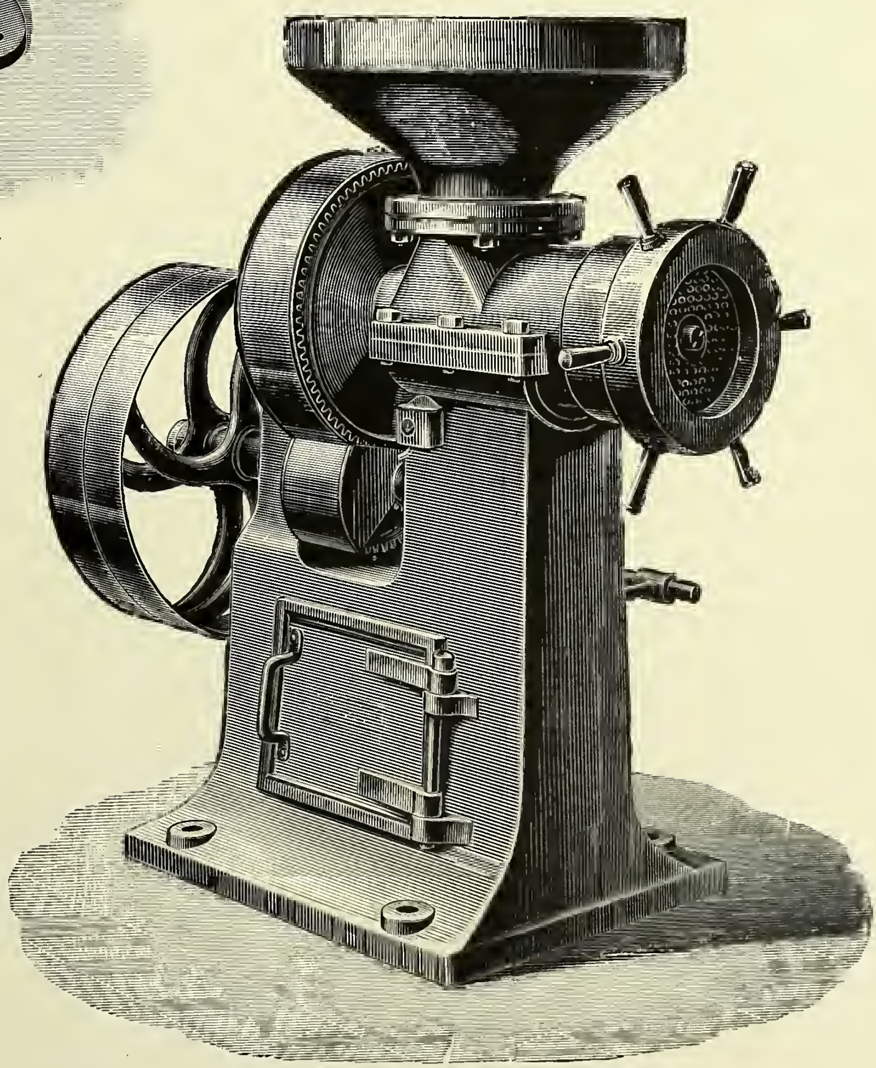
screw too tightly, as it interferes with the easy working of the machine. On the other hand, by screwing the ring on too loosely the knives and plates get clogged and the meat is forced backwards instead of through the plates. This is a most important point to attend to.

5. In putting the machine together attention should be paid to the propeller, which must be fitted correctly, so that it does not stand out from the bearing at back of machine.

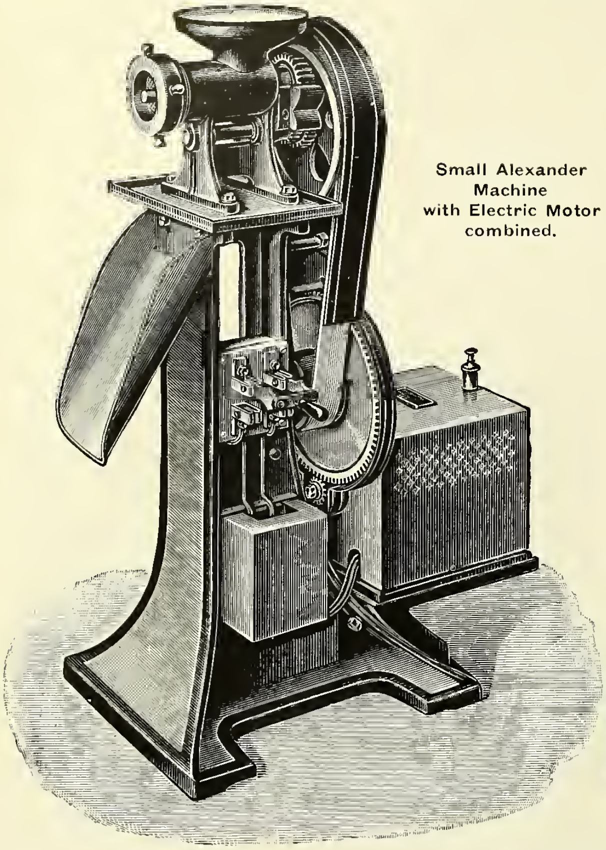
6. The meat should be cut into such pieces as will allow of an easy feed, so as to prevent the propeller clogging and tearing the meat.

To clean the machine :—Unscrew the ring (and in the case of the small hand machines the thumb-screw also) and pull out the propeller, when the inside of machine can be washed with hot water. It is essential that the spindle should be taken out occasionally and cleaned, so as to prevent it becoming fixed in the propeller through rust or other causes. Before replacing it put a drop or two of oil on it to keep it working smoothly. These machines may be had with electric motors combined and only require to have the wire carrying the electric current to be attached to make them ready for use.

The best combination is where the motor is encased in an iron frame forming the stand of machine, and effectually preventing dirt getting in about the motor. This frame is so constructed that it can be fitted with a driving pulley, which may in turn be made the medium of transmitting power to some other machine. A slipping off arrangement making it easy for the attendant to disconnect the meat cutter at will. The pulley may either be attached to the frame by being supported on an arm, or it may simply be attached to the end of shaft. Doubtless these combinations will become more popular with the advance of electric installations, more especially in large towns.



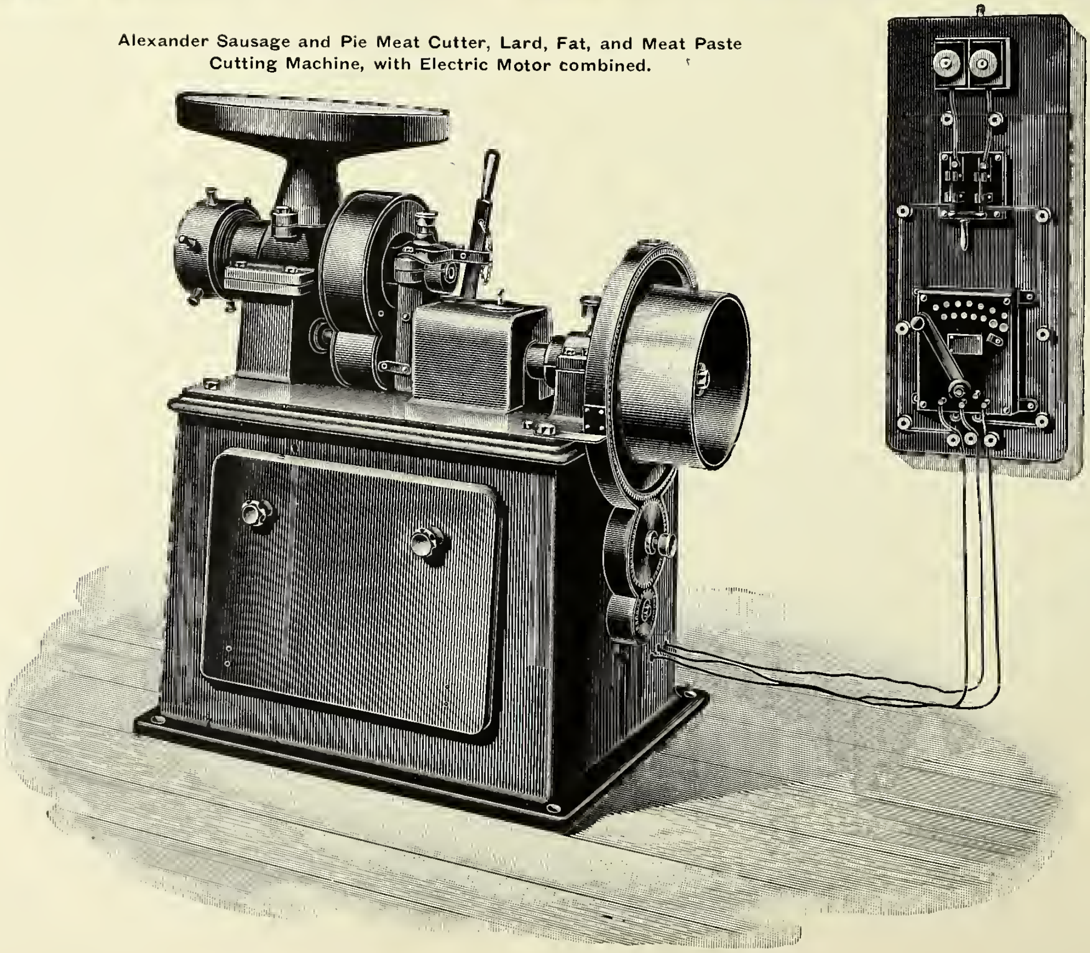
Large Capacity Alexander Power Machine.

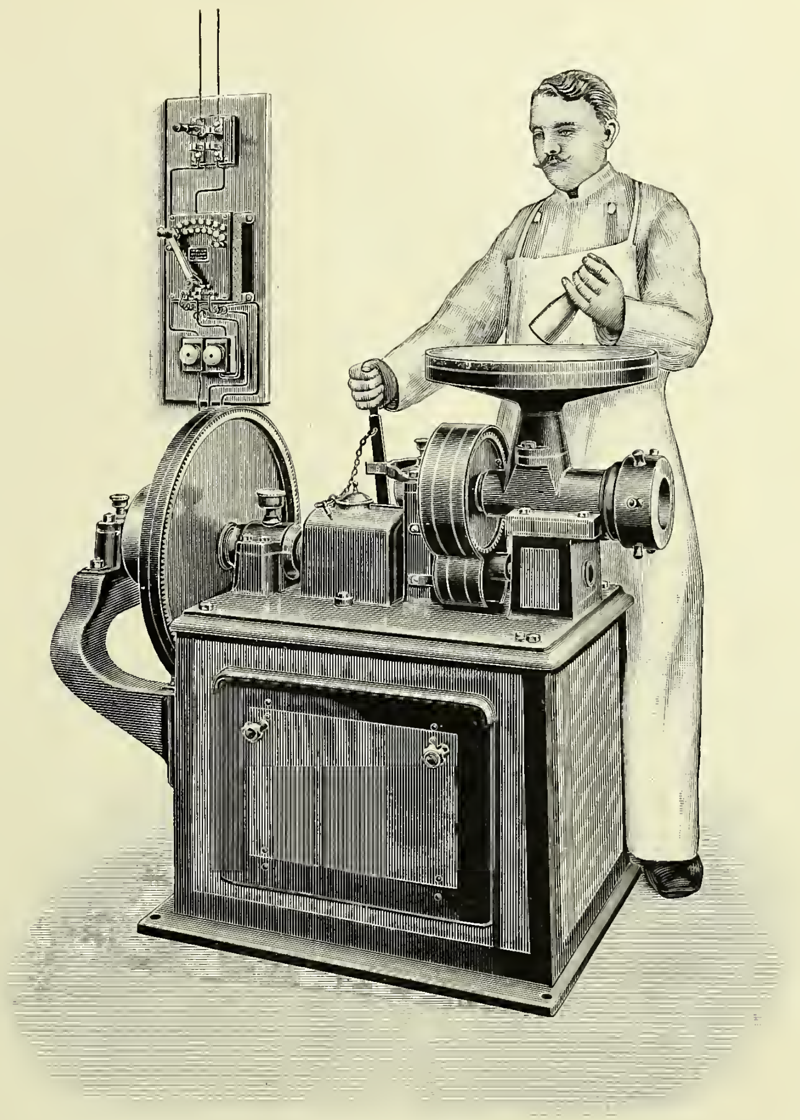


Small Alexander Machine with Electric Motor combined.

Ordinary Power Alexander Machine with Electric Motor combined.

Alexander Sausage and Pie Meat Cutter, Lard, Fat, and Meat Paste Cutting Machine, with Electric Motor combined.





Alexander Sausage and Pie Meat Cutter, Lard, Fat, and Meat Paste Cutting Machine with Electric Motor combined, showing Bracket Arm for supporting pulley for transmitting power to other Machines.

Allspice.— Otherwise known as pimento or Jamaica pepper, is a product of the West Indies. It is the berry or fruit of a tall evergreen tree that grows something in shape like an English apple-tree, but with a whitish trunk and richer, darker, and thicker foliage. The plantations are known as "pimento walks," evidently from the fact that the inhabitants of the towns in the vicinity of which the trees grow make the lanes between the aromatic-scented trees their favourite resort. The trees blossom twice, but only bear fruit once a year. When the berries form, they appear in bunches, and are picked before they are ripe and spread out in the sun to dry. Some large growers kiln-dry their produce. In the drying process the natural green colour of the berry changes into a clove-brown, and they are then stripped from the stalks and packed for export. Something like ten thousand acres of pimento trees are under cultivation in Jamaica.

The chief use of pimento is as a culinary spice, being largely sold for this purpose both in Europe and America. It has an agreeable, pungent, spicy flavour, and tastes and smells like a mixture of cloves, juniper-berries, cinnamon, and pepper, hence the name of allspice.

Alum.—A saline, white, sweetish, astringent substance, soluble in eighteen times its own weight in water. It is largely used for fixing colours as, owing to the alumina it contains, it seems to have a strong affinity for both textile tissues and dyes. It is used for fixing the dyes on the skins of German, breakfast, poloney, and other sausages. It is also largely used in the preparation of leather from skins or hides, and it is a splendid and useful astringent for stopping bleeding. It is prepared artificially from alum-shale and alum-slate.

American Maple Blocks.—see Maple Blocks.

Anthrax.—In January 1899 the Board of Agriculture issued the following information:—

Anthrax has long been known as a very fatal disease. Prior to the discovery of its cause it was attributed to feeding cattle on highly nutritious or artificial foods, which induced an attack of apoplexy or enlargement of the spleen, resulting in the sudden death of the animal. It is believed that this view as to the cause of anthrax still exists in many parts of the country, for it is a common practice amongst owners of stock, who are unaware of its dangerous and fatal character, to slaughter their cattle as soon as they present serious symptoms of illness, in order to sell the hide or to utilize the carcase for human food. The blood of the diseased animal is, no doubt, in many cases distributed over the floors of the sheds, or upon the mangers, or is carried upon the boots of the attendants, and infects other parts of the farm or premises.

It is important that it should be widely known that the view formerly entertained as to the nature of anthrax is erroneous, and that the disease is entirely due to the introduction into the blood of an animal, or of man, of the minute spores or germs contained within the anthrax bacilli, which are always to be found in the blood of animals recently dead of anthrax. The bacilli of anthrax and the spores therein die speedily if kept within the intact carcase, but multiply with great rapidity if they are exposed to the air.

It will thus be recognised that in order to prevent the extension of anthrax from diseased to healthy animals, or to persons, it is essential that the diseased carcase should not be opened, and that none of the blood or natural secretions that may contain some blood should escape, as the spores contained within the blood will multiply with rapidity, and when exposed to the air may become the means of infecting other animals.

In most instances, the first intimation of an outbreak of anthrax or splenic-fever is the discovery of a dead animal in the pasture or byre. Perhaps the animal was left a few hours before in apparent health; at least, there was nothing to attract attention, or give any warning of the near approach of death. Occasionally there are certain premonitory symptoms of an attack of anthrax which can be recognised by an expert. The affected animal is dull, and disinclined to move. If one of a herd at pasture is attacked, the fact is indicated by the separation of the sick animal from the rest. From time to time the animal will cease to feed, and stand with the head bent towards the ground, and sometimes a little blood is discharged from the nose and also with the fæces. Close attention will enable the observer to detect an occasional shiver and trembling of the limbs, which seems to pass rapidly over the body, and then ceases. The shivering fits now become more frequent, and perhaps, while these signs are being noted, the animal will suddenly roll over on its side, and, after a few violent struggles, expire. On close inspection, especially in the case of swine, it will often be found that there is a good deal of swelling under the throat, extending down the neck; and the swollen part will at first be hot and tender to the touch, but as the disease goes on it becomes insensitive, cold, and clammy.

Although a communicable disease, anthrax is not transmitted from the living diseased animal to the healthy by association, as in the case of cattle plague, foot and mouth disease, or other animal diseases of a contagious nature, but is almost invariably transmitted to the healthy animal through the medium of food or water containing the spores of the disease. These spores may also find their way into the circulation through a cut or abrasion. The disease may be introduced through the spreading of infected manure on the pastures, and occasionally outbreaks have been directly traced to the distribution upon the farms of manure containing the cuttings or scrapings of hides.

In their own interest the owners of stock should permit their animals when affected with anthrax to die, rather than slaughter them in the ordinary way, and thus infect their sheds, stock-yards, and other parts of their farms and premises, and possibly cause the death of those persons who may be engaged in slaughtering them.

It will be gathered from the preceding remarks that, since the means by which anthrax may be spread are different from those of other contagious diseases of stock, the measures to be adopted for preventing its extension should also be dissimilar.

Whenever an animal with suspicious symptoms during life dies suddenly from some unaccountable cause, the fact should be at once reported to the local authority, and the owner should forthwith plug the nostrils and all the natural openings with hay or tow saturated with a strong solution of carbolic acid, to prevent the oozing of any blood therefrom. The veterinary inspector should at once inquire as to the cause of death, and determine by careful investigation whether anthrax exists or not. This can be done soon after death by examining with a microscope a few drops of blood taken from one of the superficial veins.

It having been decided that the disease to be dealt with is anthrax, the owner should cause all the cattle, sheep or swine that have been in association with the dead animal, and are pronounced by the veterinary inspector to be apparently healthy, to be moved as soon as possible from the shed or field or other place where the disease has originated, to some other place on the farm or premises, there to be isolated. These animals should be given an entire change of food and water, and as the period of incubation of anthrax is usually very short, isolation for seven days will usually be sufficient to enable the veterinary inspector to determine whether any of these animals are infected or not.

For the burial of the carcase some part of the farm should be selected which is remote from any watercourse, and to which animals cannot or do not ordinarily have access, such as a wood or enclosure. The burial and disinfection of the carcase will be carried out under the supervision of an inspector of the local authority.

The inspector of the local authority should then carry out or supervise a rigid system of disinfection of the place or premises where the diseased animal has been detained or has died, and of all manure and broken fodder remaining therein.

The main cause of the periodic recurrence and persistence of anthrax on many farms in this country has no doubt been due to the skinning of the diseased carcases and to the want of proper precautions for their burial and disinfection. The most effectual manner of destroying the germs of anthrax is by burning the carcase, or by destroying it by means of chemical agents, and when facilities exist for carrying out either of these methods a licence of the Board must be previously obtained. In cases where burial is adopted every facility should be afforded by the owner to the inspector of the local authority in order that his duty may be effectually carried out.

It has been found by experience that where all the above-named precautions have been scrupulously adhered to, the disease frequently ceases after the death of one animal on the farm.

Antiseptic Bellows. — see Bellows for Distributing Powders.

Antiseptics.—see "Preservatives" and "Bi-sulphite of Lime."

Antiseptic Varnish.—This is a varnish used for coating German or luncheon sausages so as to prevent them from getting mouldy. In summer especially this is a great trouble to german sausage makers and the use of this varnish saves much loss. The varnish is simply painted on to the outside skin after the sausages are cooked and dry. They will then have a splendidly bright appearance and will keep free from mould for a very long period—several weeks.

Area and Population of some foreign countries and British possessions as compiled by the Board of Agriculture, giving the year in which the totals were made up.

Countries and Possessions.	Area. (In English Statute Acres.)	Population. Number.	Population. Year.
	Acres.	*No.*	
FOREIGN COUNTRIES. Austria-Hungary: 1. Austria	(b) 74,106,000	24,919,000	1896
Austria-Hungary: 2. Hungary (a)	79,617,000	18,444,000	1896
Belgium	(b) 7,276,000	6,496,000	1896
Bulgaria	23,643,000	3,311,000	1893
Denmark	(c) 9,372,000	2,320,000	1808
France	(b) 130,557,000	38,518,000	1896
Germany	(b) 133,500,000	55,052,000	1899
Holland	(c) 8,040,000	5,004,000	1897
Italy	(d) 70,787,000	31,479,000	1897
Roumania	32,362,000	5,800,000	1892
Russia in Europe: 1. Ex. Poland	(e) 1,244,367,000	94,189,000	1897
Russia in Europe: 2. Poland	31,451,000	9,443,000	1897
Servia	11,931,000	2,312,000	1895
Spain	124,636,000	18,090,000	1895
Sweden and Norway: 1. Sweden	(c) 101,565,000	5,010,000	1897
Sweden and Norway: 2. Norway	(e) 76 717,000	2,082,000	1896
Switzerland	(e) 9,900,000	3,083,000	1897
Algeria	86,038,000	4,429,000	1896
Argentina	714,998,000	4,569,000	1899
Uruguay	46,177,000	840,000	1896
United States of America	(f) 2,292,087,000	74,389,000	1898
Japan	94,499,000	43,229,000	1897
United Kingdom	(g) 77,675,000	40,708,000	1899
BRITISH POSSESSIONS. Canada	2,122,014,000	5,248,000	1898
Cape Colony	177,217,000	1,880,000	1897
Natal	12,000,000	631,000	1897
Australasia	1,974,463,000	4,532,000	1897
British India	(h) 617,596,000	(h) 221,173,000	1891
Details for— United Kingdom: England	32,546,000	31,743,000	1899
Wales	4,774,000		
Scotland	19,456,000	4,282,000	1899
Great Britain—Total	56,776,000	36,025,000	1899
Isle of Man and Channel Islands	193,000	(i) 148,000	1899
Ireland	20,706,000	4,535,000	1899
Canada: Ontario	140,576,000	2,114,000	1891
Quebec	145,600,000	1,489,000	1891
Manitoba	41,002,000	153,000	1891
Other Parts	1,794,836,000	1,275,000	1891
Australasia: New South Wales	198,635,000	1,323,000	1897
Victoria	56,447,000	1,176,000	1897
South Australia	578,361,000	363,000	1897
Western Australia	624,589,000	162,000	1897
Queensland	427,838,000	485,000	1897
Australia—Total	1,885,870,000	3,509,000	1897
Tasmania	16,778,000	172,000	1897
New Zealand	66,861,000	729,000	1897
Fiji	4,954,000	122,000	1897

(a) Including Croatia and Slavonia. (b) Including Lakes and Rivers. (c) Excluding Lakes and Rivers. (d) Including Lakes. (e) Excluding Lakes. (f) Including Indian Territory and Alaska and Public Land Strips, having an area of 413,684,000 Statute Acres. (g) Area of Land and Water, but exclusive of Foreshore and Tidal Water. (h) Not including Feudatory and Tributary States. (i) Census of 1891.

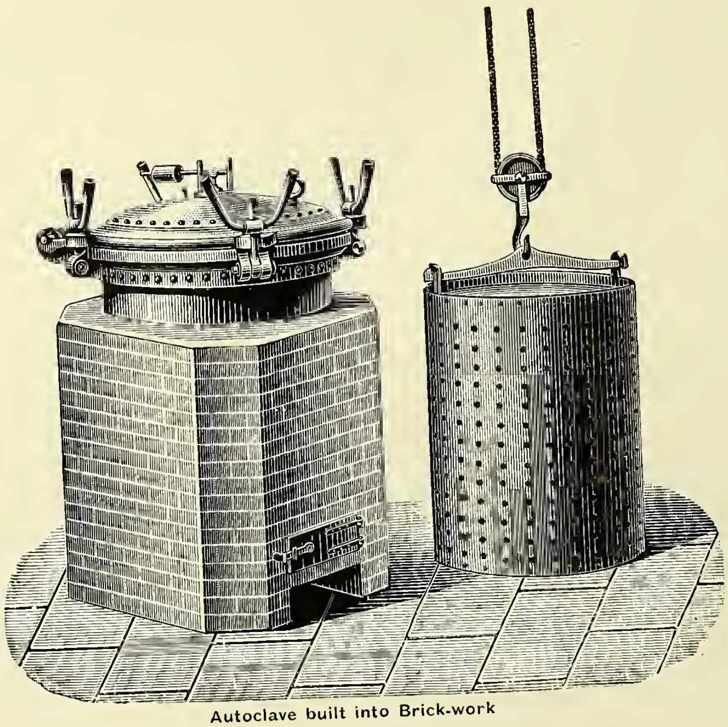
Australian Produce.—See under names of Colonies.

Autoclaves.—These are steam jacketed pans with covers fitted to stand pressure. They are used for sterilizing soups, preserved meats, milk, fruit, vegetables, etc., etc., in bottles, tins, or jars. They may also be used for extracting soups from bones, etc., under pressure.

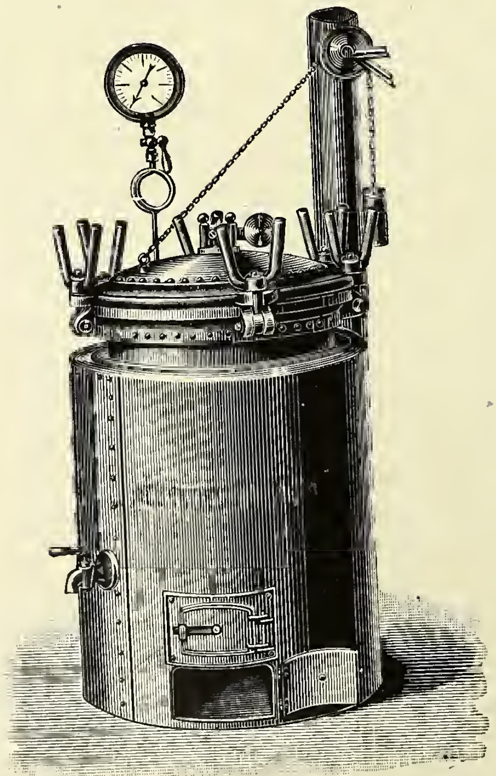
Auto-Cure of Bacon.—This term is applied to the mechanical curing of bacon. The process was exhibited first of all at the Exhibition, 1861, since when it has been adopted by some curers in Sweden, Denmark, and Canada.

The following is a description of the process :—

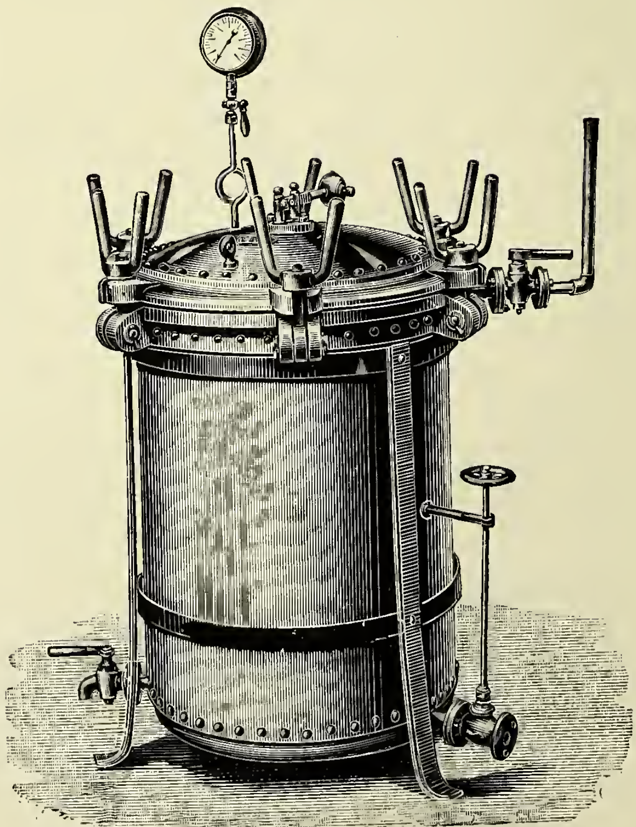
After the hogs are killed and handled in the usual manner as well as chilled, the sides of pork are laid in rows on a



Autoclave built into Brick-work

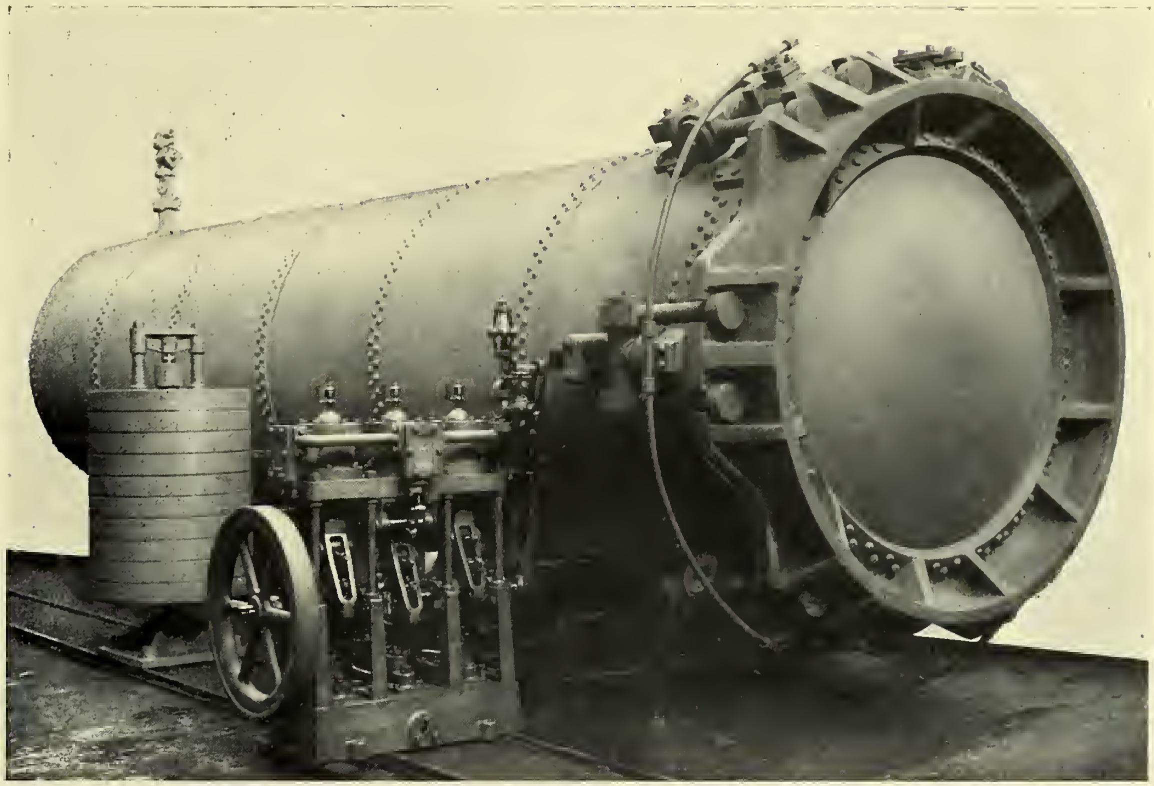


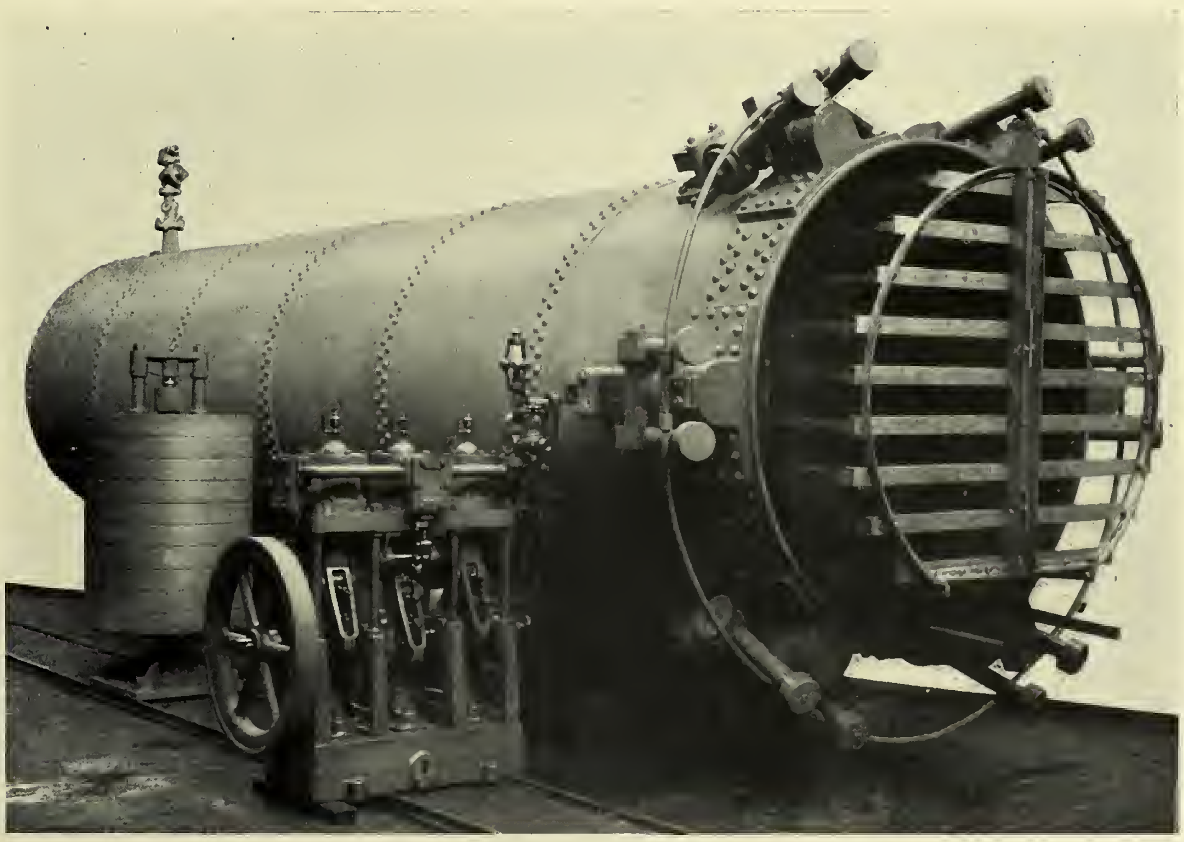
Autoclave for Fire Heat with Iron Mantle.



Autoclave for Steam.

Auto-Cure Cylinders Closed and Open.





sort of truck which exactly fits into a large cylinder of steel 32 feet long, 6 feet in diameter, and which will hold altogether 210 sides. The cylinder having been filled, the lid or shield weighing $3\frac{1}{2}$ tons (7000 lbs. Danish) is slid into its place, and is hermetically closed by means of hydraulic pumps at a pressure of 3 tons (6000 lbs. Danish) to the square inch. As soon as this is done, all the air is pumped out by means of a vacuum pump which creates a vacuum of 28 inches. To give some little idea how high this pressure is, the Westinghouse vacuum brake on a passenger train affords a good example as a contrast: it only requires a vacuum of 6 inches to stop it dead. Thus one can easily understand how completely the air must be pumped out when the vacuum is raised four-and-a-half times as much. Of course, by this means the air is also pumped out of the pork, the pores of which open. This pumping out of the air lasts about one hour, and then the brine channel leading from the brine reservoir holding 6000 gallons of brine is opened, and the brine rushes into the cylinder of its own account, since there is no air there, and fills what is not taken up by the trucks and pork in a few minutes. But now a quantity of air has again penetrated into the cylinder with the brine, and when this has also been exhausted, the real auto-cure begins. This is effected by the following means:—

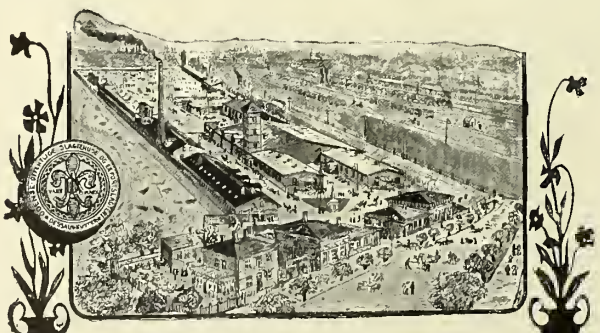
The brine is pumped into the cylinder at a pressure of 120 lbs. per square inch until no more can be pumped in. By this means the pork, every pore of which was thoroughly opened whilst the air was being pumped out, becomes entirely saturated with the brine, and remains under the same pressure from four to five hours. The pickle runs back into the reservoir, and after having been filtered and strengthened, can be used over and over again. The bacon can then, if necessary, be shipped abroad at once.

There is nothing to hinder the pigs being killed one day, salted the next, and packed and shipped on the third day.

In the machine-room is the hydraulic pump with an accumulator used to close the shield or lid of the cylinder, a vacuum pump to suck the air out of the cylinder, and a force pump to pump the brine into the cylinder.

There are two reservoirs for brine and two cylinders, and the bacon is pumped with a needle in the ordinary way before being put into the latter.

The auto-cure claims to be a great improvement in the curing of bacon, insomuch as the bacon can be got ready much quicker for the market and catch it if there is likely to be a fall in prices, but whether the keeping and other qualities of the bacon are improved is a question on which the opinion varies.



General View of Farmer's Export Bacon Factory and General Abattoir, at Odense, Denmark.

Average Prices of Fat Cattle (Live Weight).—see Live Stock Returns.

Average Prices of the several kinds of Dead Meat per stone of 8 lbs at the London Central Market during 1899 (compiled from the prices quoted weekly in the *Meat Trades' Journal.*)

Beef—			
Scotch, short sides	4/3	to	4/6
,, long sides	3/11	,,	4/1
English	3/9	,,	3/11
Cows and bulls	2/	,,	2/10
American, Birkenhead-killed	3/5	,,	3/8
,, Deptford-killed	3/6	,,	3/9
Argentine, ,,	3/	,,	3/4
American, refrigerated, hind-quarters	3/7	,,	3/10
,, ,, fore-quarters	2/4	,,	2/6
Australian, frozen, hind-quarters	2/1	,,	2/4
,, ,, fore-quarters	1/8	,,	1/9
New Zealand, frozen, hind-quarters	2/3	,,	2/6
,, ,, fore-quarters	1/9	,,	1/11
Mutton—			
Scotch, prime	4/5	,,	4/11
English, ,,	4/2	,,	4/8
Ewes	3/1	,,	3/6
Continental	3/9	,,	4/2
River Plate, town-killed	3/3	,,	3/6
New Zealand, frozen	1/11	,,	2/8
Australian, ,,	1/10	,,	2/
River Plate, ,,	1/11	,,	2/
Lamb—			
English	5/	,,	6/2
New Zealand, frozen	2/11	,,	3/3
Veal—			
English	4/4	,,	4/9
Foreign and secondary	3/8	,,	4/2
Pork—			
English, best	3/6	,,	3/11
,, secondary and foreign	3/	,,	3/5

The average wholesale prices of beef and mutton per lb. at London, Liverpool, and Glasgow for 1899 were as follow:—

	London Central Markets.	Liverpool.	Glasgow.
Beef	$3\frac{3}{8}$d. to 6d.	$3\frac{5}{8}$d. to $5\frac{5}{8}$d.	4d. to $5\frac{5}{8}$d.
Mutton	3d. ,, $7\frac{1}{4}$d.	$5\frac{1}{4}$d. ,, $7\frac{3}{8}$d.	$5\frac{1}{2}$d. ,, $6\frac{7}{8}$d.

and the average values per cwt. of imported meats were as follow:—

	£	s.	d.
Fresh Beef	£1	18	8
Salted ,,	1	5	11
Fresh Mutton	1	11	7
,, Pork	2	1	11
Salted ,,	1	1	6
Bacon	1	15	10
Hams	2	1	5

BACK-SAW.—see Saws.

Bacon Branding.—From time immemorial the branding of bacon meats has been universal. The process is simply the burning into the skin of any particular name or device which is difficult to remove and which is an implied warranty that the curer of the meats gives along with them. "Branded" meat is always supposed to be of the best selections. "Unbranded" meats are, on the other hand, either

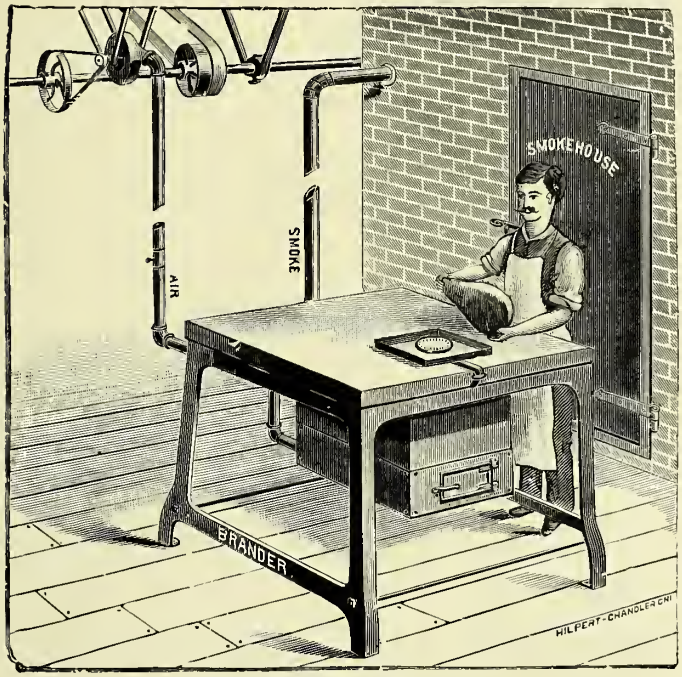


Fig. I.—Branding Hams.
(Under the table is a coke fire.)

unsuitable selections or else meats that have once been branded and have had the brand scraped off. Sometimes it may happen that bacon has been kept too long until it is out of condition. In that case it will be sold as unbranded, the brands having been removed.

The process of branding is performed as soon as the sides of pigs are hung up in the "hanging-house," and before the meat is chilled. With hams, rolls, middles, and such-like sections, however, the branding may be deferred until the goods are being sent out; hence there is no rule in the matter.

The old-fashioned process is to use cast-iron brands. These are very often circular in shape, about 6 inches in diameter and about $1\frac{1}{2}$ inches thick. Attached to them is a holding iron rod which is fastened securely to the branding-irons. On the face of the cast iron is the name of the firm or other inscription. These irons cost a good deal of money, inasmuch as they are heated in a coke fire or on a coke stove and get gradually burnt away.

Several methods have been tried so as to supersede this old method of branding—notably electricity but the latter has not been a success.

Hams are generally branded on removal from the smoke-stores, and are branded in various ways.

Brander, Handy Ham.—This is a clean and thoroughly efficient apparatus. From its portable nature it is very convenient, and as any combination of letters can be made in a very short time, it is particularly useful to those who desire to do all their branding with one apparatus so as to economise space. The centre words are cast in one piece, as are also the bottom names, while the other wording is made up of single letters so that they can be varied as required. The gas flame has a cover over it which prevents singeing. The frame and letters are made of brass, and are practically everlasting, and in this way is a big advance on the old-fashioned method of using cast-iron brands which are always getting done through burning.

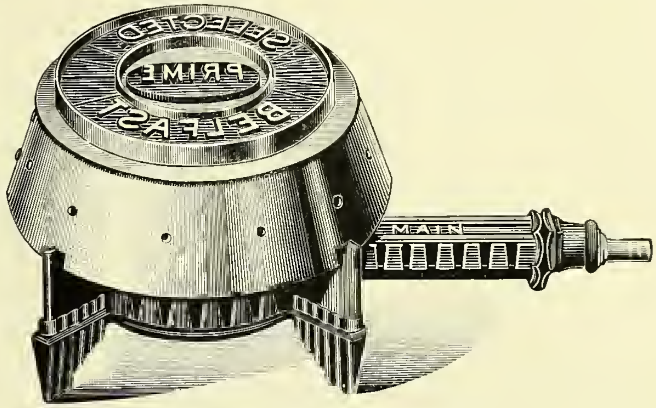


Fig. II.—Handy Ham Brander.
(Heated by gas from a Bunsen Burner.)

In the United States a more elaborate system is in use for achieving the same result; the gas brander is hung to the ceiling by a chain with a counterpoise weight attached to the end as illustrated in Fig. III. and Fig. IV. A fan is used for forcing air into the supply pipe along with the gas, thus procuring an intense heat. Hughes' patent gas branding apparatus is another variety, the illustration of which (Fig. V.) explains how it is worked. It is simply a brander specially made so as to be easily heated in a stove fired by gas on the Bunsen principle.

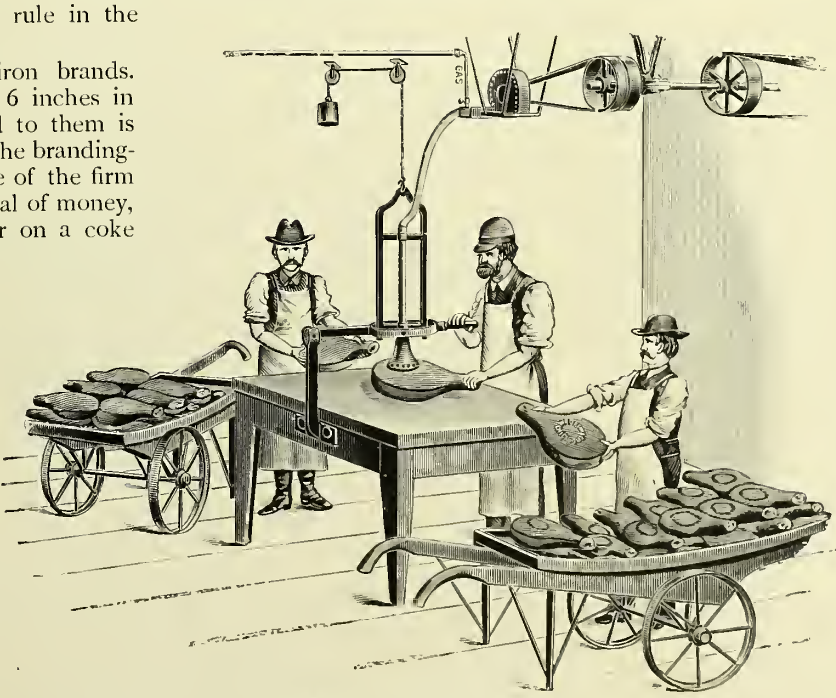


Fig. III.—Branding Hams.
(The brand is heated by means of gas and a mixture of air forced through a fan.)

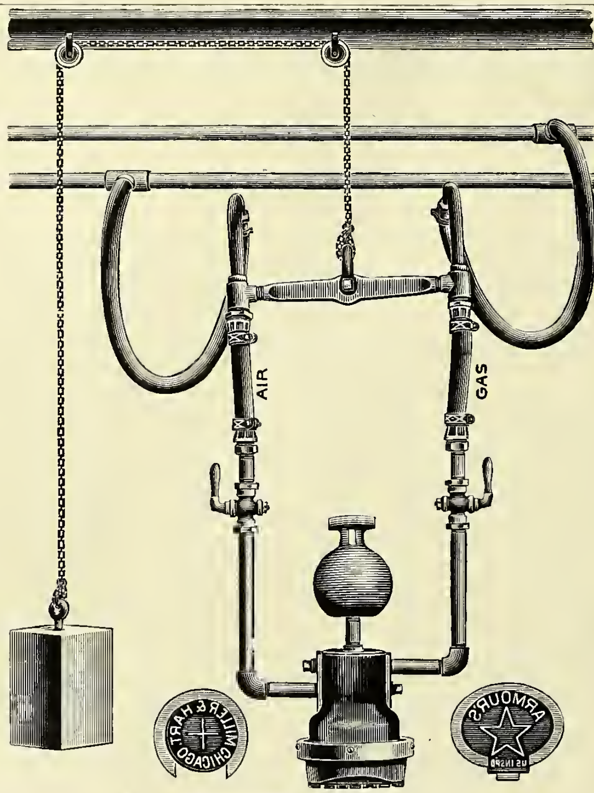


Fig. IV.—Gas Brander as used in America

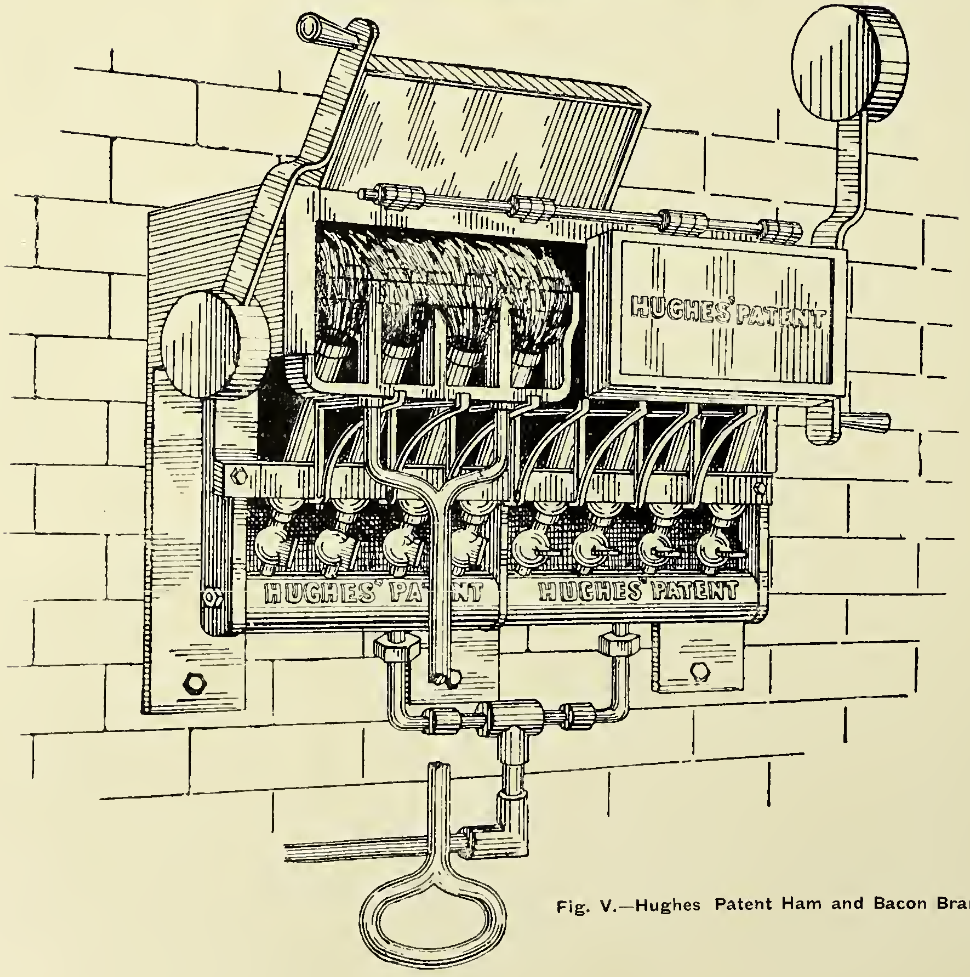
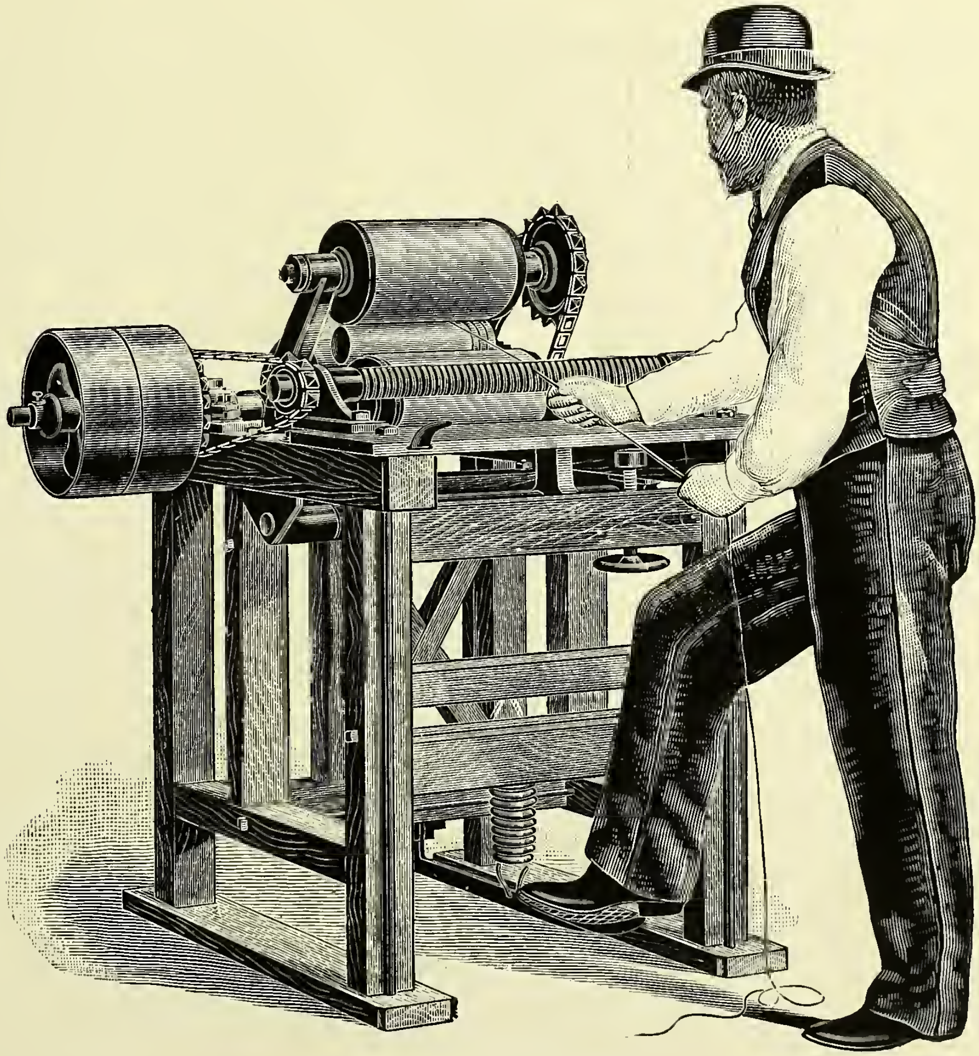


Fig. V.—Hughes Patent Ham and Bacon Brander.

Bacon and Ham Rolling.—The great volume of business which is being done in the United States and England in "Rolls" as applied to bacon would seem to warrant the work being done mechanically. Many attempts have been made in this direction, but so far none have met with any great success. The rolling machine figured (The Wilder Roller and Wrapper) is one which claims that the work of rolling and wrapping is done evenly and quickly. As many as 2500 pieces have been wrapped in one day with this machine! For quantities approaching this it is necessary to have a staff of one man and two youths. One of the youths makes the first tie, hands the ham to the man who wraps it, and the second youth makes the last tie.



The Wilder Ham Roller and Wrapper.

Bacon Factories and Bacon Curing. — Bacon curing is the term applied to the art of preserving pork, and it is practised in smaller or greater degree all over the world. The origin of the industry is obscure, and no data is available on the subject. The word "Bacon" itself is old French. Until the middle of the nineteenth century, the trade in bacon may be said to have been carried on in a crude manner. but, about that time there sprang up in Ireland and in England curing establishments conducted on scientific lines. In the United States of America the same development took place and since then rapid and continuous progress has had to be recorded both in America and in Europe. The chief centre in America is Chicago: in Europe the chief curing country is Denmark. Many factories exist, however, and are being built in the United Kingdom.

There are three principal places where curing is carried on.

1. The farm.
2. The shop (principally pork shops).
3. Bacon factories.

On the farm the process is necessarily crude, and the custom of curing there is dying out owing to the impossibility of making the mild cured meat in demand by modern buyers. Farm cured bacon is yet extensively made in Yorkshire, but in the face of modern knowledge it is hardly likely to be a lasting industry.

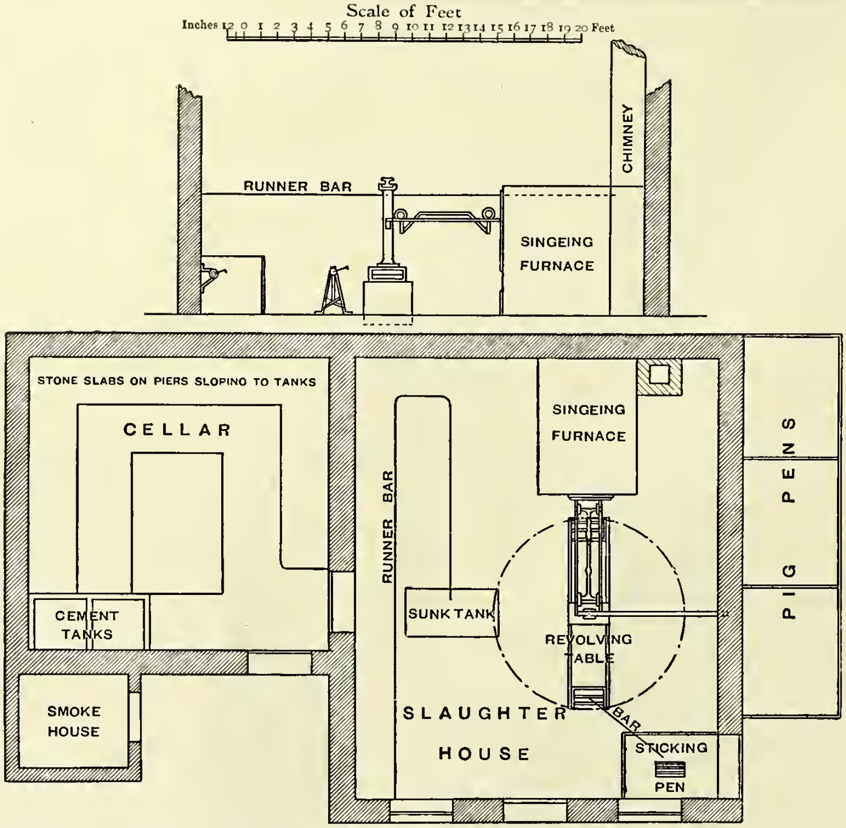


Fig. I.—Bacon Factory with a capacity of 50 pigs per week.

In the pork shops scattered throughout the world bacon curing forms a necessary part of the business and in a great many cases is successfully carried on. Usually the modern shop is fitted with a cellar, and much can be done in such a place. Besides, the risks are now much diminished as small refrigerating machines are available so that the meat can be properly chilled and also a low and equal temperature can be maintained in the cellar. (see "Pork Purveyors' Shops."

The process of slaughtering pigs and curing them is practically the same on the large as on the small scale. The only difference between the two, lies in the increased dimensions of the equipment and the sizes of the appliances.

A small bacon factory is a simple affair.

A factory to handle 50 pigs per week *without* a refrigerator would only require as equipment the following essential appliances, viz :—

1. Wall hoist in slaughtering pen.
2. Small horizontal singeing furnace
3. Tracking.
4. Two lard pans (40 galls).
5. An Alexander cutter for lard and sausage meat, also a sausage filler.
6. The smaller appliances such as pickle pump, etc.

The buildings as shewn in Fig. I. would be very plain and a raised platform would be necessary all round the cellars and one in the centre of the floor. These would slope in the direction of the pickle tanks. A small smoke house would make such a place complete.

But there are many difficulties attending the conducting of a factory without a refrigerator. In winter the factory without a refrigerator would be able to produce with care, mild cured meat, as it would have the advantage of a constant low temperature. That, however, is attended with some risk inasmuch as it is found that "muggy" or close weather is as destructive to meat as warm weather.

Safety in curing is pretty well assured when a refrigerator forms part of the mechanical equipment. In Fig. II. is shewn a design for a small factory which embraces all the essential appliances including a refrigerating machine.

The appliances would be somewhat different from those necessary in the design shown on Fig. I. The list would include :—

1. Wall hoist in slaughtering pen.
2. Scalding tank.

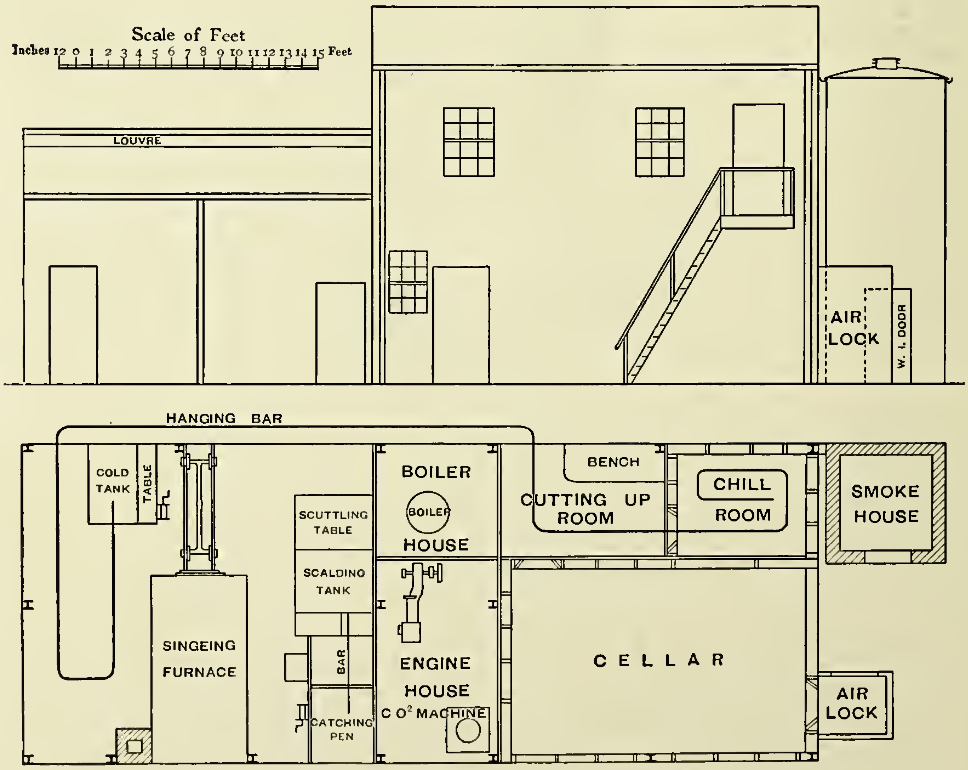


Fig II.—Bacon Factory with a capacity of 50 pigs per week.

3. Singeing furnace.
4. Scuttling table.
5. Boiler and engine.
6. Refrigerating machine.
7. Sausage machinery.
8. Lard room plant.
9. Tracking throughout and in smoke stoves.
10. Auxiliary appliances such as, pickle pump, tubs and tools of various kinds.

A variation of the same design so as to include accommodation for both cattle and pigs might with advantage be provided on large estates or in rural districts where 75 pigs and about 30 cattle per week could be dealt with.

apply. The quantities handled there are enormous, and in some cases reach 5000 to 6000 pigs per day. The system of curing, however, in all cases does not materially differ nor do the appliances, except in number. It is easy to understand that where 500 pigs are handled in one week, the mechanical appliances for handling these will be fewer in number than in a factory where 25,000 per week are dealt with. By duplicating and spreading these over a sufficiently wide area there is no limit to the number of pigs that can be handled.

Everything, however, must be strictly proportionate—the slaughtering department to the hanging-house, chill rooms, and cellars, and the proportioning of the machinery to these. Where a bacon business is the first consideration, the auxiliary departments of sausage making, lard refining, and

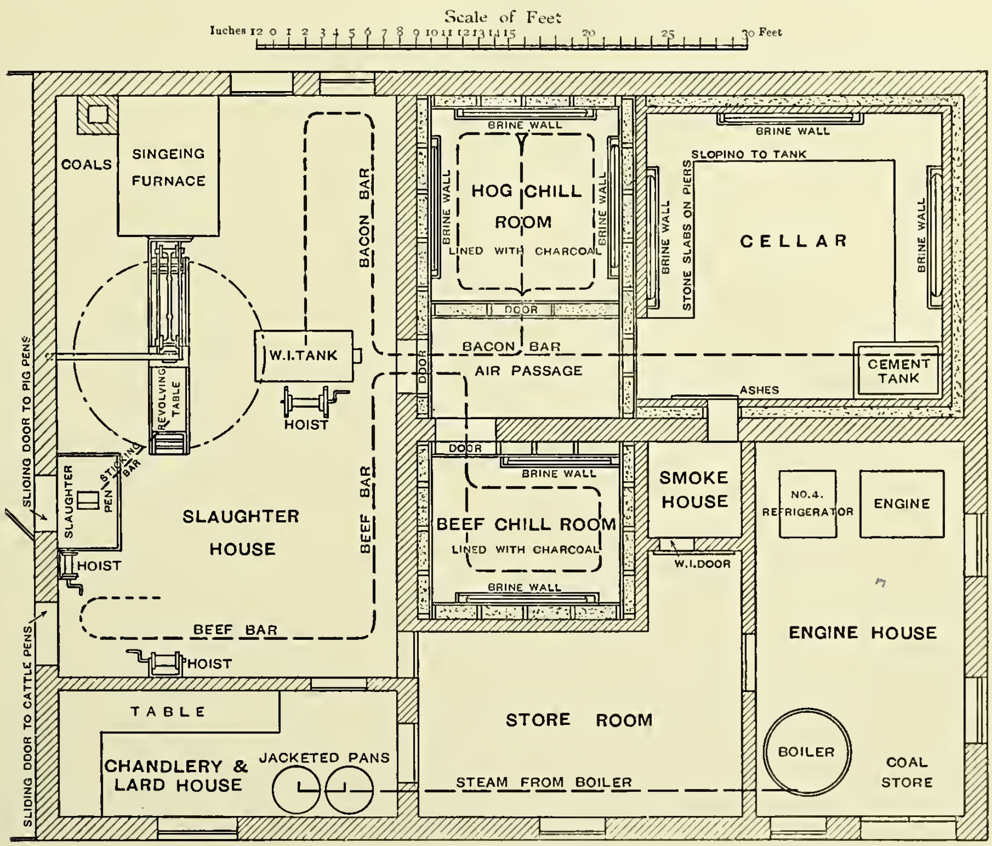


Fig. III.—Ground Plan of combined Bacon Factory and cattle slaughter-house: to deal with 75 pigs and 30 cattle per week.

In the plan shewn in Fig. III. such a combination is illustrated. The equipment in this case would be more elaborate than the two others mentioned, but in so far as the bacon factory portion is concerned, the appliances necessary would be somewhat similar to those as shewn in Fig. II., but the refrigerating plant would require to be much larger so as to provide power for chilling the cattle and any other animals slaughtered.

Large Bacon Factories.—In Europe the large factories which have been constructed for bacon curing are designed, in the majority of cases, to handle from 500 to 1000 pigs per week. There are a few which can, and do, handle 1000 to 2000 per week, and one or two can occasionally exceed that number. In the United States these figures do not

bye-products treatment, must strictly depend upon the number of pigs slaughtered. In this matter a certain amount of knowledge and experience is always an advantage, but where such are not to be had the next best thing is to take advantage of such account of the practice of the present day as can be put on record. We propose to give a brief epitomé of this practice here.

It will be convenient to refer to a factory designed to deal with from 500 to 1000 pigs per week, as factories in Europe are not likely to be built of greater dimensions, it being found that, owing to the local conditions of transport, it is better to build factories of that size at centres where such a number of pigs can conveniently be delivered.

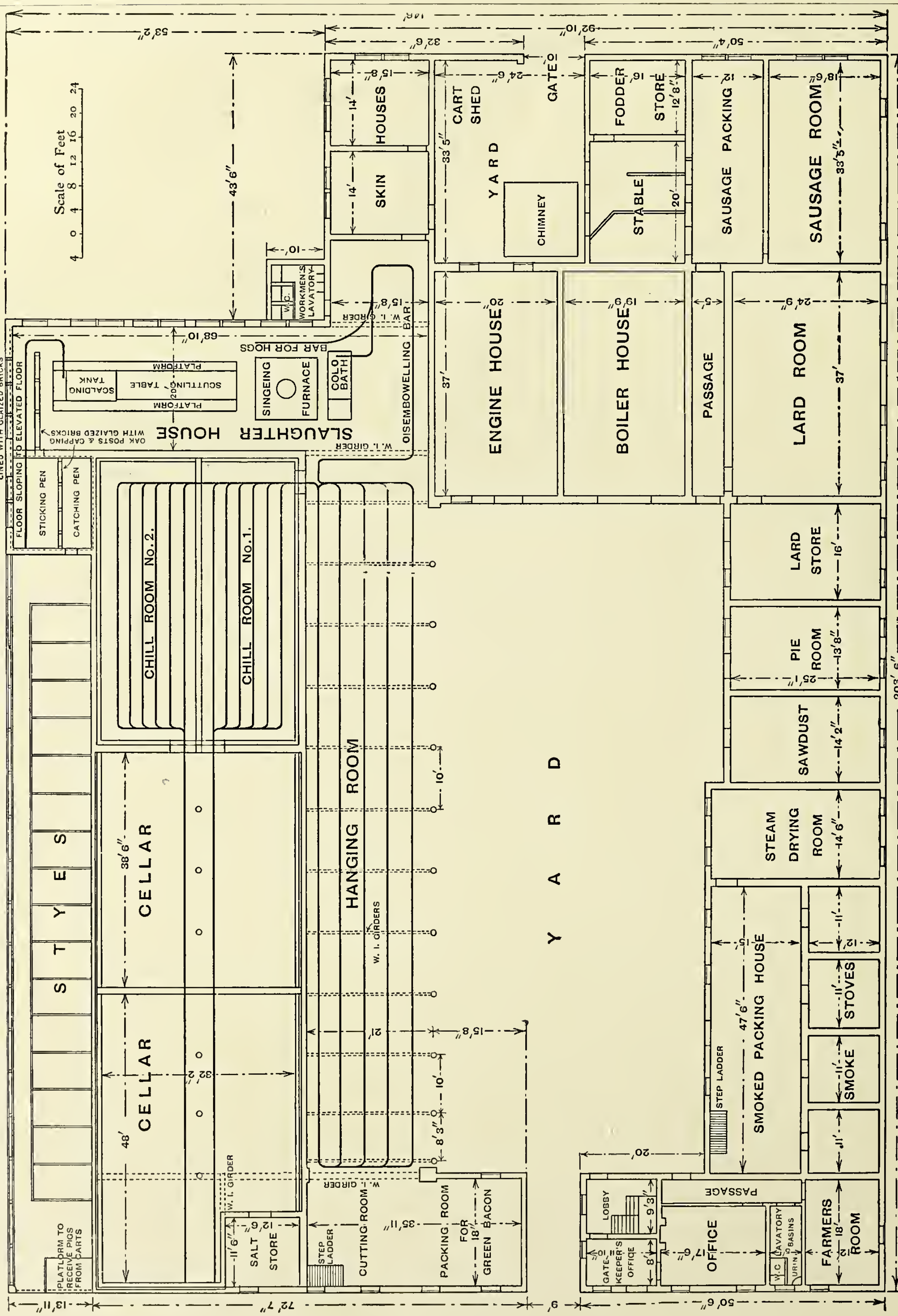


Fig. V.—A modern Bacon Factory—Ground Plan—capacity 500 to 1000 pigs per week.

The departments of a bacon factory are as follows :—

1. The pig-styes.
2. The slaughtering department divided into the following sections :—
   (*a*) The catching pen.
   (*b*) The sticking pen.
   (*c*) The bleeding passage.
   (*d*) The scalding tank and scuttling table.
   (*e*) Singeing furnace and disembowelling bar.
   (*f*) The gut department.
3. Hanging room
4. Chill rooms.
5. Cellars.
6. Cutting up and packing room for green bacon.
7. Smoke stoves and baling loft for smoked bacon or hams.
8. Drying room and packing loft for pale dried bacon or hams.
9. Lard room.
10. Sausage and small goods rooms.
11. Boiler house.
12. Engine room.

Bacon Chill Room.
Chilling the sides of bacon at 38° Fahr. before putting them into the cellar to be cured.

The pig-styes are conveniently situated so as to lead right up to the slaughtering pen. They are generally designed so as to be very strong and rigid and of a capacity to hold say 12 pigs each, thus the different lots of pigs from various growers can be kept separate. Their structure is a very simple matter and is conveniently carried out in brick strengthened with upright posts and having horizontal rounded coping timbers let into them and also the wall of the factory.

From the pig styes the pigs are driven along a roadway traversing the front of all the styes and opening into the catching pen into which the pigs are driven.

The catching pen is simply a rectangular room and of sufficient size to accomodate the workmen. It has a very high sticking bar to which the pigs are raised, and this bar is led through bleeding passage, terminating at the dumping table. Here the leg chains are removed. Joined to the dumping table is the scalding tank, which is of sufficient size to hold five pigs at one time floating in the water. It is mounted on a platform and all around runs a platform upon which the workmen stand when handling the pigs. This platform is continued so as to be common to the scuttling table and so that the men can work at both conveniently.

Next to the scuttling table is the singeing furnace, and beyond that are the disembowelling bars. It is convenient to have the gut and fat houses in an opposite direction to the hanging house, so as to keep away any offensive smell from the meat. The next important department is the hanging room where the carcases are hung up to cool.

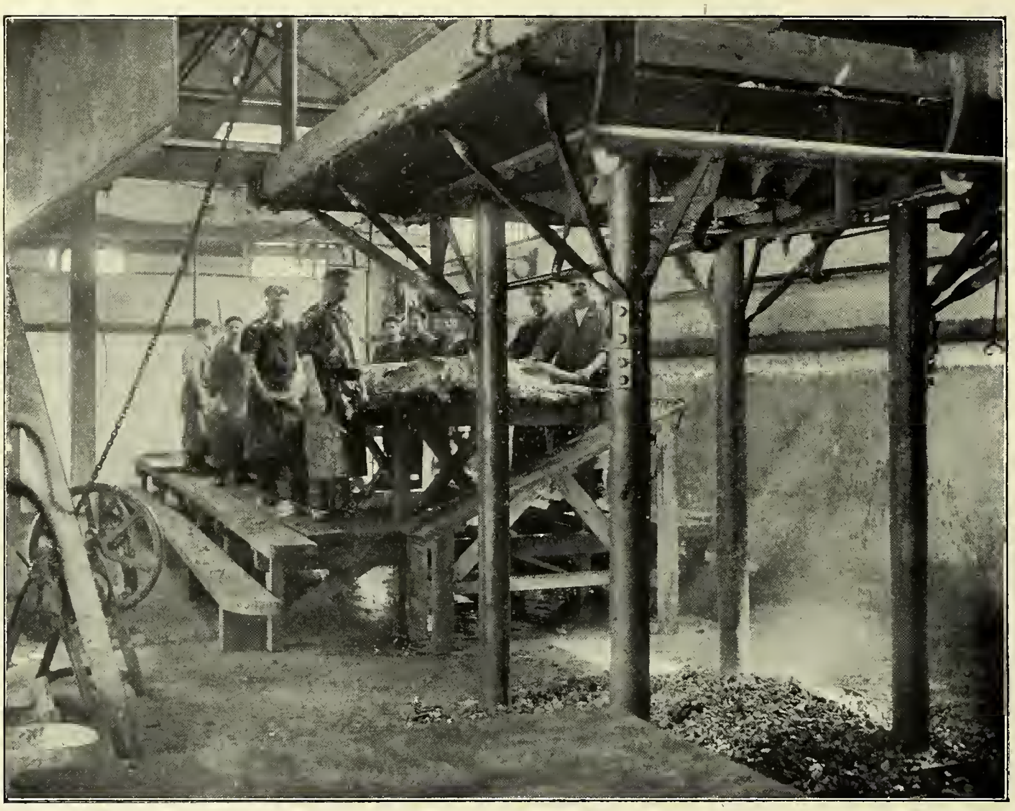
A hanging house should be light and airy so that the air may have plenty of play about the carcases.

Next to the hanging room is the chill room where, after the carcases have been cooled, and freed from the excess of animal heat, they are put.

From the chill room the sides are taken to the cellars to be cured. Here we must have a perfectly constant temperature of 42° and constant humidity.

The other departments are of an auxiliary character, and depend entirely for the dimensions, on the amount of trade done.

Operations in the Factory previous to Curing.—In 1814, just a year before Waterloo, a scotsman, (Robert Henderson) not distracted by the rumours of war or the great issue just about to be tried, wrote an interesting book, which he sent forth into the world under the resounding title of a "Treatise on the breeding of Swine and the Curing of Bacon," and in it he describes, quaintly enough, the difficulties of the bacon curer in the early part of the nineteenth century. They had no mechanical appliances in those days. He says: "I practiced for many years the custom of carting my flitches and hams through the country to farmhouses, and used to hang them in their chimneys and other parts of the house to dry, some seasons to the amount of 500 carcases. This plan I soon found was attended with a number of inconveniences, having to take along with the bacon pieces of timber, to fix up in the different houses, for the purpose of hanging the flitches and hams. For several days after they were hung up they poured down salt and brine upon the women's caps, and now and then a ham would fall down and break a spinning-wheel, or knock down some of the children, which obliged me to purchase a few ribbons, tobacco, etc., to make up the peace. But there was a still greater disadvantage attending this mode; the bacon was obliged to hang until an order came for it to be sent off, which being at the end of two or three months, and often longer, the meat was overdried in most places, and consequently lost a good deal of weight. This method is practiced to this day in Dumfries-shire. People in general are so partial to old customs that it is nearly impossible to remove them." That is a



Hoist to Singeing Furnace. Scuttling Table. Singeing Furnace.

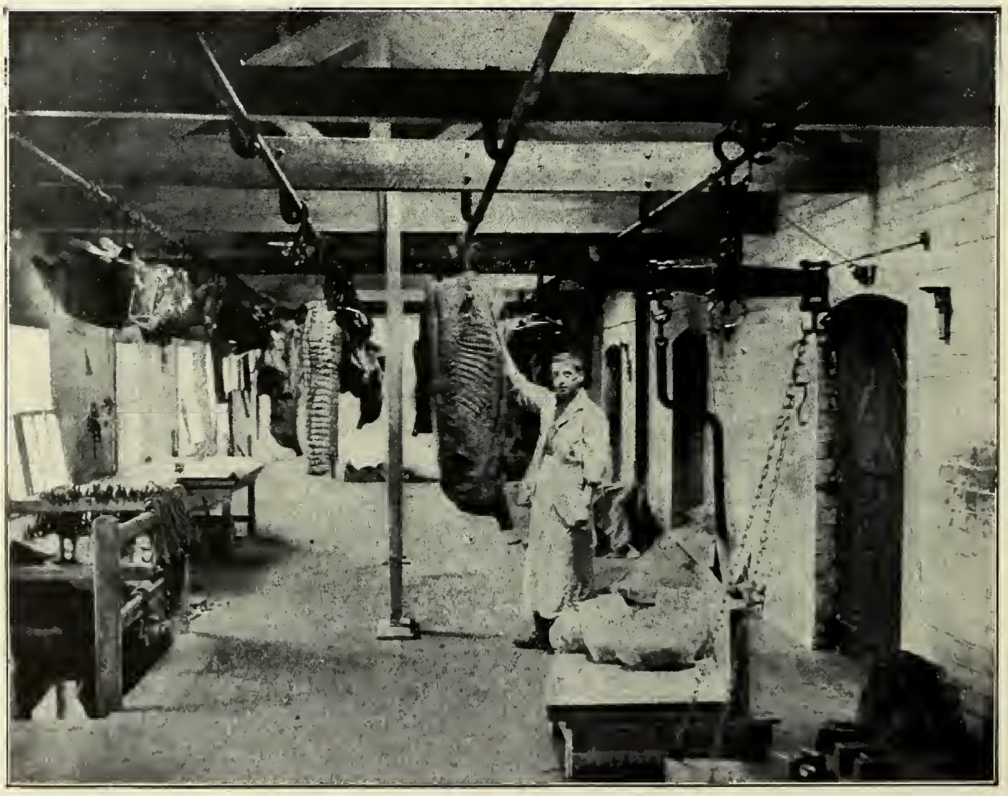
View showing Scuttling Table and base of Singeing Furnace.

Modern Hanging House.

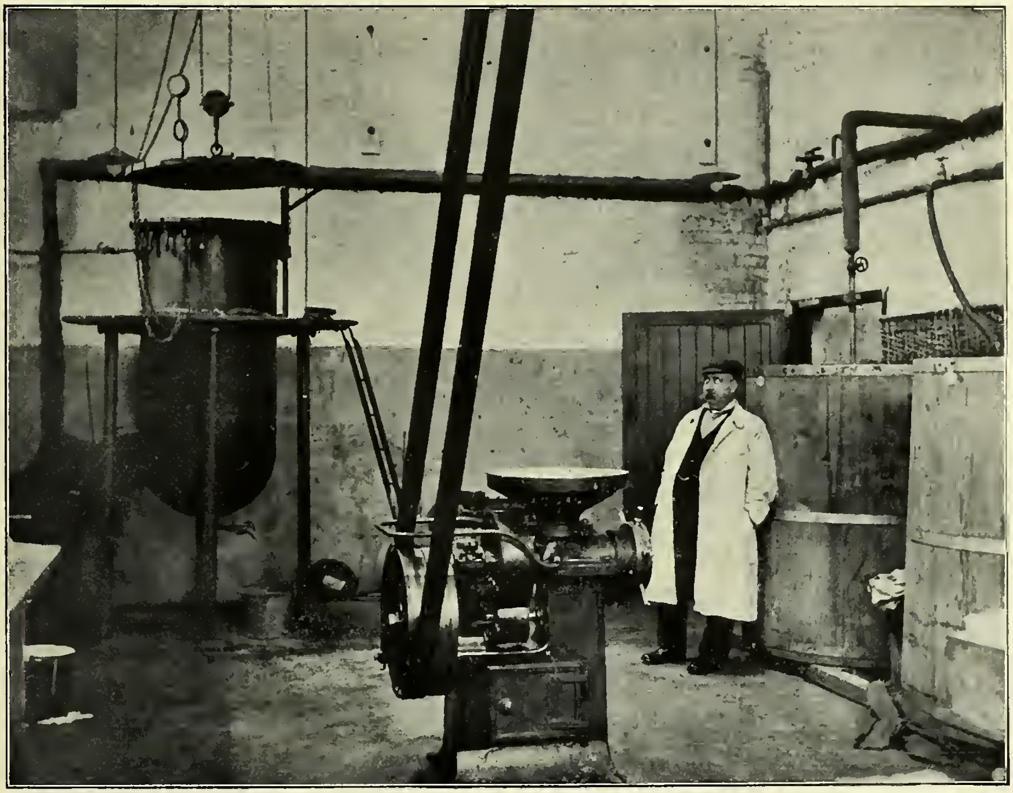
Modern Hanging House.

Pig Hanging House shewing arrangement of Hanging Bars.

Selecting Room for Smoked Bacon.

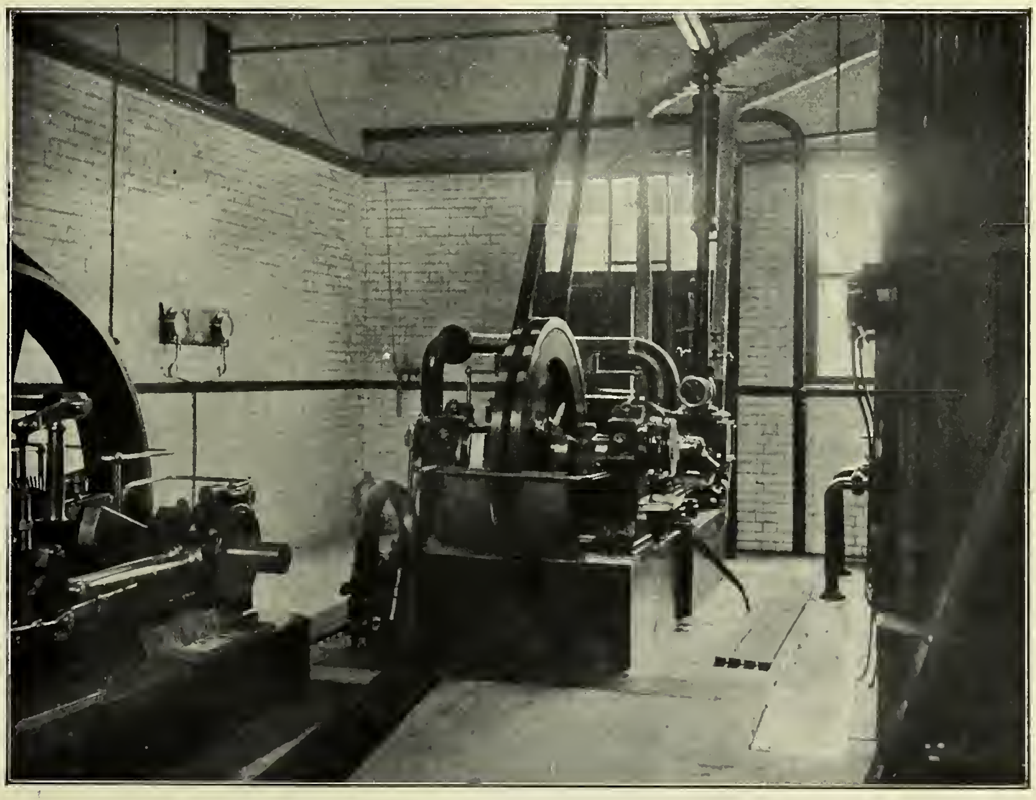


Weighing and Selecting Room for Smoked Bacon.



Bone Digestor. Lard and Fat Cutter. Mudgeon Vats.

Interior of Workroom of a Bacon Factory shewing Mudgeon Vats, Lard Cutter, and Bone Digestor.



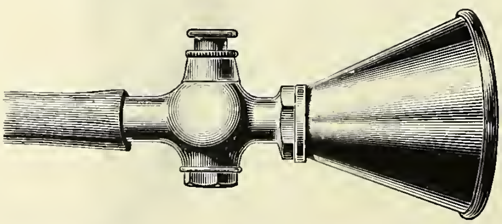
Refrigerating Machine in Engine Room of Modern Bacon Factory.

picture of a very primitive state of affairs, which happily in our day has only an antiquarian interest.

Modern Operations in the Bacon Factory are carried out in a regular order so as to avoid handling as far as possible, and get through the work quickly. The process is as follows: a chain attached to a friction hoist is lowered into the "shackling pen," which is a small pen opening from the pig-styes, and into which the pigs are driven one by one. At the end of this chain is a ring, and to this is attached a chain hook with two lugs. This chain hook has also a ring at the end of it, and through this ring the chain is made to form a loop which is slipped over one of the hind legs of the pig. Instantly the friction hoist is set in motion and the pig hoisted. The unoccupied lug of the leg chain is dropped on to an overhead track bar and immediately a knife, nine inches long, is thrust into the neck of the pig in the direction of the heart, so as to sever the aorta or main blood vessel.

Bacon Curing Cellar shewing bacon stacked and being cuseo

The pig is pushed along the track bar into the "bleeding passage," and in a few seconds all the blood has run out. This process is repeated *ad libitum.* The next operation is to scald the pigs so as to remove the hair. This hair is a valuable commodity, and the stronger portions which grow in the ridge of the back are often cut off before scalding takes place so as to be preserved for tooth and other brush making. Good "bristles," as this hair is called, are worth about 9s. per lb. The scalding takes place in a long square tank, into which the pigs are rolled from a "dumping" table, on which they have been dropped in order to allow of the removal of the leg chains. The body of water in the tank is sufficient generally to hold five pigs at one time, and is at a temperature of from 140° to 180° F., according to the size of the pigs to be dealt with. The pigs are rolled round in this tank until the hair comes away easily in the hand. They are then tilted on to a "scuttling table" by means of a "cradle," and either scraped clean by hand or



Water Rose for Scuttling Table attached to Flexable Tube.

For washing pigs when being scraped after being taken out of scalding tank and is suspended from overhead supply pipe of I. R. tubing over scuttling table.

by a scraping machine. A "gob" hook or double lugged hook is then inserted into the apex of the lower jaw, and the pigs are suspended head upwards to a track bar passing beneath a vertical singeing furnace. One by one the scraped pigs are hoisted up through the fire of the furnace, where they are allowed to remain for 25 seconds. They are then lowered again on to the track bar and either thrown on to a table and dashed with cold water or plunged into a cold bath. Both operations are intended to cool the carcases The object of this singeing is to harden the fat and the rind, and it also imparts a peculiar flavour to the meat. So much do some people believe in this that they sacrifice the possible profit to be got from the hair and singe the pig with the hair on. The burnt hair intensifies the desired flavour. In Wiltshire the general custom is not to scald bacon pigs; in Ireland and Denmark it is universal to do so. As soon as the burnt carcases are cool the hind legs are slit so as to expose the sinews, and behind these are inserted the ends of gambrels or spreaders to which are attached bar hooks with double lugs, and by means of a hand or friction hoist they are raised to the track bars head downwards.

All the subsequent operations take place on the track bars until the sides are lifted down so as to be cured. First of all water sprinklers play upon the carcases whilst they are scraped clean. When cleaned they are opened and the intestines taken out and assorted. This offal produces many things, and is dealt with in various businesses. The liver is separated and is generally exported to Germany for the making of liver sausage—a commodity which might with great advantage be made in this country. The stomachs are separated, and from them the pepsin manufacturer extracts the pepsin, which is used so extensively as a stimulant to digestion by those unhappy people who require it. The smaller intestines are assorted and cleaned by a long and careful process, and are used by sausage makers for sausage making. The larger intestines are used for liver sausage making, and are mostly exported. On the small scale where the quantity of offals is not great, the intestines and stomach are cleaned, cooked, and sold in the cooked state as "chitterlings." The heart, liver, and lungs, being cut up into slices, are mixed together and sold as "pig's fry."

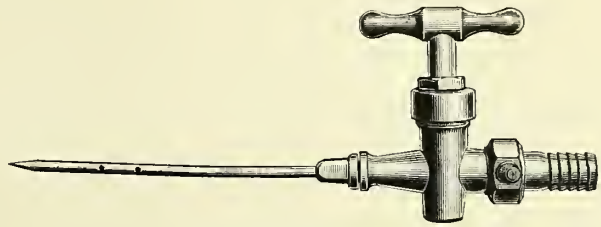
When the offal has been removed, and the carcase cleaned, they are pushed along the track bars into the hanging house. Here they are allowed to hang for a few hours, so as to get rid of the animal heat. They are also weighed, and a deduction of 2 lb. per side is generally made for shrinkage in cooling. This is what is known as "dead weight." The pig, as weighed, comprises head, feet, two sides, and kidney fat; and upon this weight payment is made, generally the same day. As soon as the carcases are fairly cool they are split down the back, and the back bone or vertebral column is removed. The sides are then separated, and feet, head, and kidney fat having been removed, they are slid along the track bars into the chill room. It is essential in every bacon factory to have a refrigerating machine competent to cool the chill room when full down to 38° Fahr., and to reduce the meat to that temperature.

Curing Bacon.—The whole work of the factory depends upon the proper chilling and cooling of the meat, and the maintaining of a constant temperature of 40° to 42° Fahr. in the cellar. It is, therefore, altogether desirable that much attention should be given to the selection of a refrigerating machine, and when selected it should be in duplicate, if possible; also in chill rooms and cellars there should always be a duplicate system of cold air circulation and cold brine storage. The old style was to put a large store of ice—say several hundred tons—over the cellar, and from the cold produced as the ice melted the temperatures were kept low. But that system with all its difficulties has passed away, and given place to the modern system of refrigerating machinery. When the sides have been cooled down to 38° Fahr. they are run along the bars into the cellar through a door from the chill room to the cellar, and then the process of curing really begins.

The process of curing or salting bacon is a very simple one, but it is also a thoroughly scientific one. The following is a description of the process in somewhat technical language, but it conveys actually what takes place:—

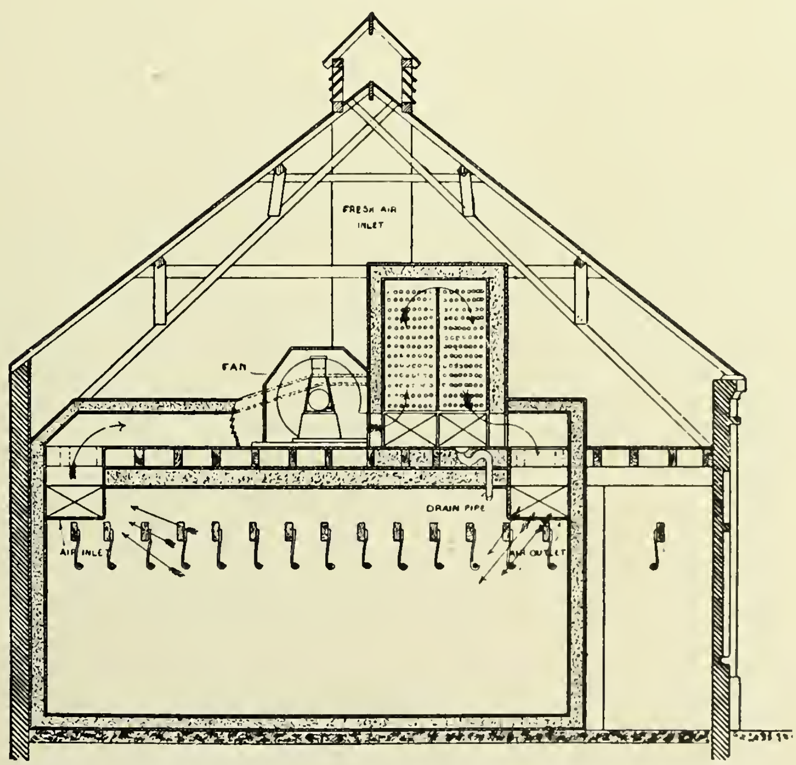
"Salting, as commercially practiced is a process of osmosis or diffusion; a crystalloid applied externally, either as a solid or in strong solution, diffuses into the interior, while the soluble albuminous matters pass out into the brine. Soluble mineral salts and sugar, also act as partial dessicators by their affinity for water. The flesh is deprived of a great part of its putrescent constituents, but at the same time loses a corresponding nutritive value (Liebig estimated the loss at one-third to one-half), and leaves nearly insoluble fibrinoids, partially hardened and less digestible—'induratas sale,' as Pliny says (Hist. Nat. xxviii. 20)." Deprived of technicalities, this simply means that we destroy a certain proportion of the meat in order to preserve the remainder, and in the process we render the remainder more difficult of assimilation than it was when fresh. Salted or cured meats therefore are less valuable as food than fresh meats. But as it is impossible to conduct the human economy on fresh meats, it is not likely that a general knowledge of this fact would alter the consumption. The displacement of the albuminous compounds referred to is termed "curing," and is carried out thus:—

the sides are laid on benches and pumped in about 17 places with a pickle testing 100° on the (Douglas) salinometer at 60° Fahr. The pumping pressure should be 40 lbs. per square inch, as indicated on an ordinary pressure gauge. The sticks of the pump needle are all into the fleshy



Needle of Pickle Pump.

parts, the thin flanks not being pumped at all. The pickle used consists of 55 lbs. salt, 5 lbs. saltpetre, 5 lbs. antiseptic and (in winter only) 5 lbs of pure cane sugar. These ingredients are made up to 20 gallons with fresh water, and stirred until the whole are dissolved. The pickle is then allowed to settle until clear, and is better if it is boiled and skimmed. In any case the clear pickle is run into the cellar, and is not used until it is of exactly the same temperature as the cellar. Immediately after the sides are pumped they are laid down rind downwards and covered lightly with an equal mixture of dry antiseptic and fine saltpetre. On top of this is laid a heavy layer of salt. The sides are "stacked" one on top of the other, and the thin flank, or belly portion, is kept up by means of oak staves. Two pieces of oak should be laid along the belly—one lying in the direction of the gammon to fore-end should be 2 feet



Section of Chill Room shewing duplicate system of brine and cold air circulation.

long by 2 inches wide and $\frac{3}{4}$ inch thick. The other placed in an oblique position should be 15 inches long by 2 inches wide and $\frac{3}{4}$ inch thick. These pieces should be well seasoned in brine before use. The stacks are not meddled with until the cure is complete, which is in ten days for nine score, and twelve days for ten score pigs. After that time in salt the bacon is "struck," and according to the market to be supplied is drained, washed, trimmed and sent off.

Much of the bacon consumed in England is smoked, and many factories have facilities for smoking. The smoke stoves want a good deal of watching and care, and should always be under a competent man. Cured bacon is drained from seven to ten days, and is then washed, wiped, and trimmed. It is next dusted over with pea meal, and hung in the smoke stove for three days at a temperature of 85° Fahr. The smoking material used is oak sawdust. After the bacon is smoked it is packed up in bales with clean barley or wheaten straw between each side and is sent out. When the bacon reaches the provision shops it is cut up into recognised sections.

Form of Log Sheets for Chill Rooms of Bacon Factories

Log of Chill Rooms,
Date.................................

No. of Pigs Killed............... Time of Killing...............
Outside Temperature at 6 a.m......... At 12 Noon..... ...

	CHILL ROOMS.				CELLARS.			
	No. 1	No. 2	No. 3	No. 4	No. 1	No. 2	No. 3	No. 4
Temperature at 6 a.m.								
Moisture ...								
Temperature at 12 noon								
Moisture ...								
Temperature at 6 p.m.								
Moisture ...								
Temperature at 12 midnight if working Machine ...								
Temperature of Room before putting in......								
Moisture ...								
Temperature of......... when put in ...								
Temperature of........ at time of Salting ...								
Moisture of Room when.......taken out								

REMARKS.

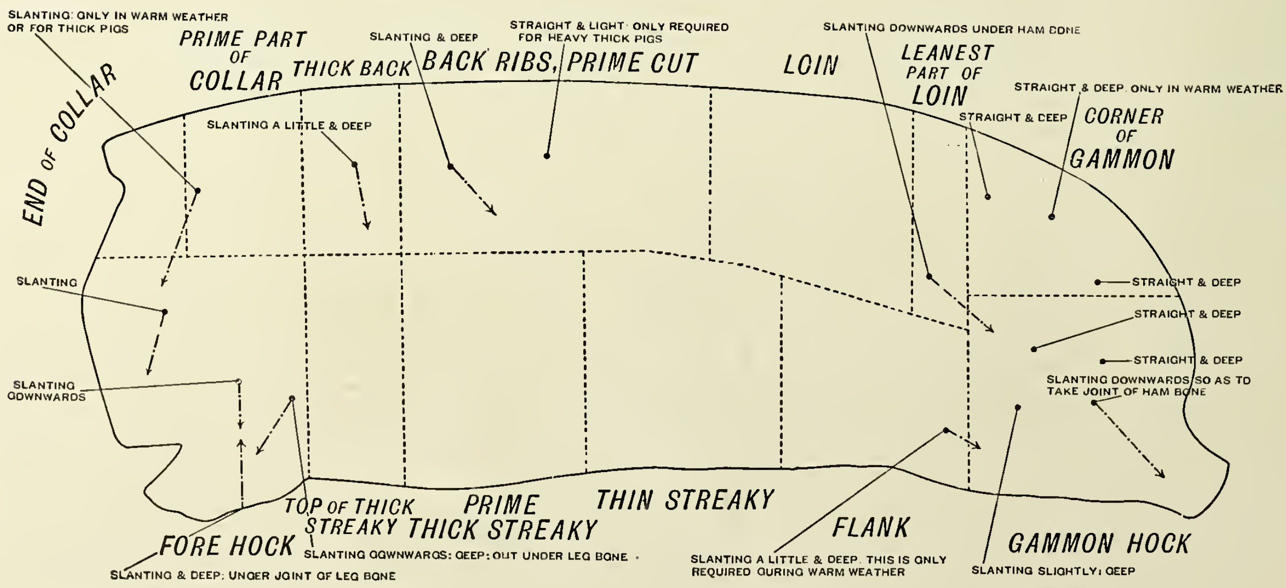


Diagram showing the names of various portions of a side of bacon, with the places and direction for the Needle of Pickle Pump.

The following are the various sections into which bacon is usually cut and the comparative average prices obtainable for each:—

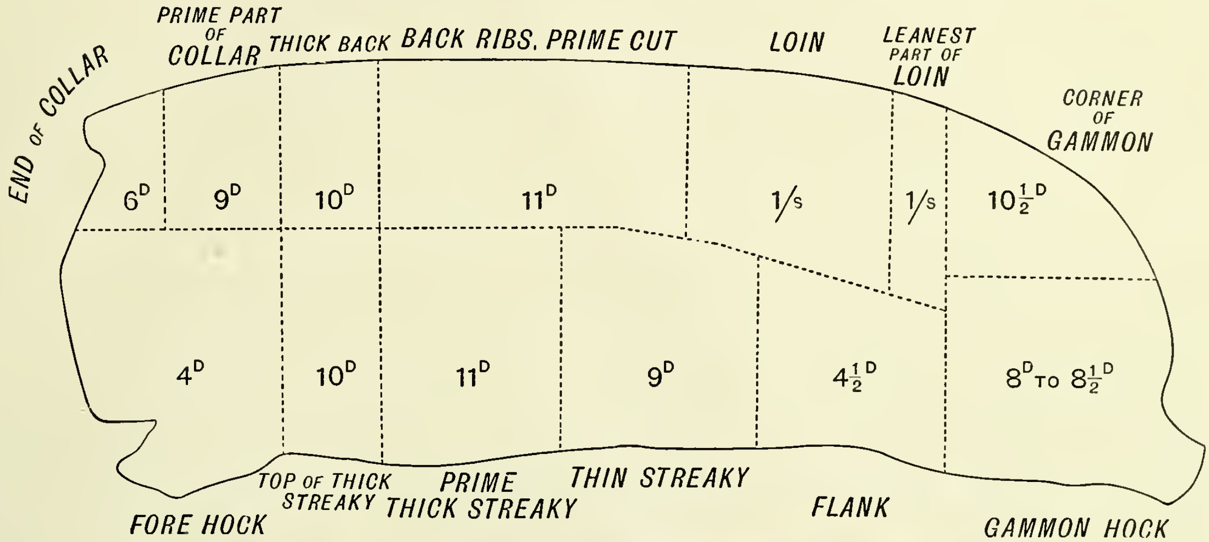


Diagram of Side of Bacon.

Corner of Gammon.
Three-quarter Gammon.

Flank.
Thin Streaky.
Long Loin.
Thick Streaky.
Back and Rib.

End of Collar.
Prime Part of Collar.
Fore Hock.

All the Principle Cuts of a Side of Bacon.

Side of Smoked Wiltshire Bacon.

Side of Wiltshire Bacon shewing how to begin cutting up

Side of Pale Dried Wiltshire Bacon.

Fore-end of a Side of Bacon.

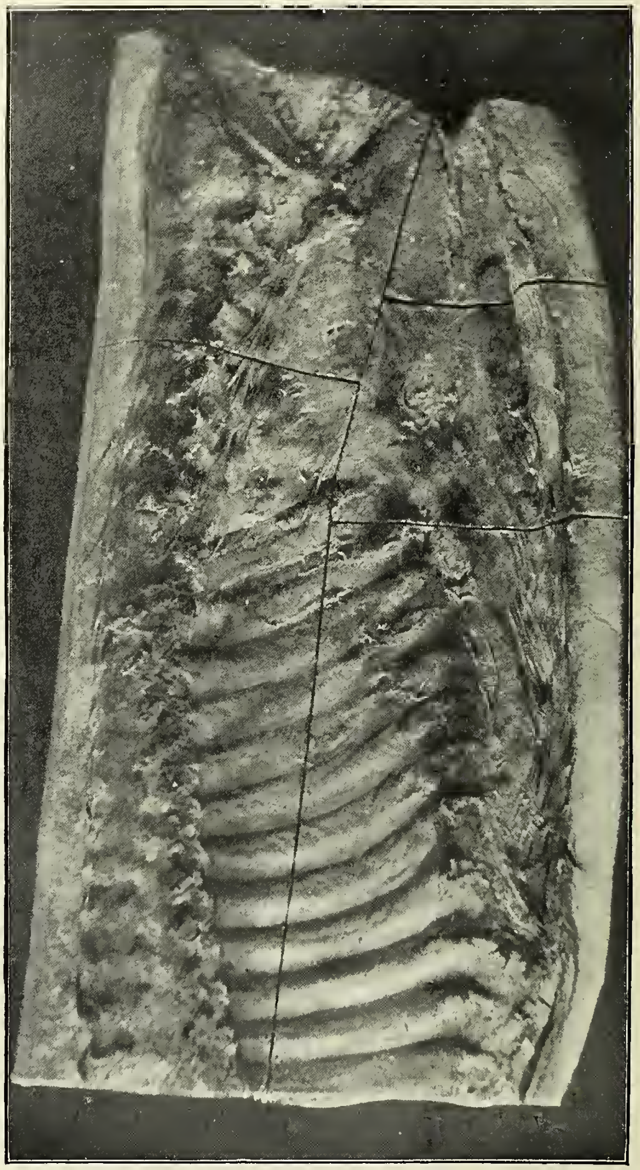
Prime Part of Collar. Fore Hock. End of Collar.

Fore-end of a Side of Bacon shewing Cuts.

Corner of Gammon. Three-quarter Gammon.

Gammon shewing two Principal Cuts.

Gammon of a side of Wiltshire Bacon.



Loin.
Back.

Flank
Thick Streaky.
Thin Streaky.

Middle of Side of Bacon shewing Cuts.

Middle of Side of Bacon.

Bacon Curing in Denmark.—The steady and continuous increase in the exports of bacon from Denmark to England continues, and agriculturists in the latter country can only suppose that the cause must be the superior manner in which bacon is produced in Denmark. The actual figures are :—

Quantities and Values of Bacon imported into England during three years.

1897.	1898.	1899.
1,026,552 cwts.	1,017,520 cwts.	1,210,612 cwts.
£2,744,430	£2,701,112	£2,945,757

During 1900 there is a further increase.

Against these figures it is interesting to put the latest agricultural returns in so far as they concern pigs in the United Kingdom. The figures are these :—

Number of Pigs of all sorts in the whole of the United Kingdom.

(These returns are made up to 4th June 1900).

1899 - - - -	4,003,589
1900 - - - - -	3,663,669
Decrease - -	339,920

This is not encouraging on the face of it. It must be borne in mind, however, that swine fever has been prevalent over wide areas in the United Kingdom, and that so long as it exists the production of pigs in large numbers will always be attended with much risk.

It is satisfactory to know that several large and important bacon factories are being constructed in Ireland and England, and that every possible effort is being made to retain at home portion at least of the gigantic sum of money we send abroad annually for bacon and hog products.

Uniformly the Danish bacon comes to us in as well cured a state as any we get. It is well cured and neatly packed and put out of hand, our Danish friends knowing very well that the secret of all good trade is to first of all please the eye. The factories themselves are well planned, and are models of cleanliness. This is just as it should be, and is the true rule to follow.

So far, no account has yet been published of the methods adopted in Danish factories Fortunately we are able to give a detailed account of the whole process here, and it will be seen that it is of a very simple character. Very little, however, is done by rule of thumb.

The greater majority of bacon factories in Denmark (there are now about fifty of them), are single storey buildings, the process of turning the live hog into bacon being carried out on the ground floor.

Underground cellars, first floors, and lofts are only used for storing wrappers, rope, lard, dried sausages, hams, salt, etc.

Most Danish bacon factories may be divided into the following halls and rooms : — Pig styes, killing pen, slaughtering-hall with adjacent room for cleaning inwards, and containing several cemented basins with running water laid on and used to hold the guts when cleaned, hanging house, where the carcases of the slaughtered hogs hang to cool before they are pushed into the chill rooms (this house is generally used as cutting up and trimming room the day after killing), chill rooms, cutting cellars, head and feet cellars, baling room, lard room for boiling and refining, sausage house, and engine room.

The process of turning the live hog into bacon can be divided into five divisions, viz.:—Killing, cooling in the open air, cutting up and trimming, chilling and salting.

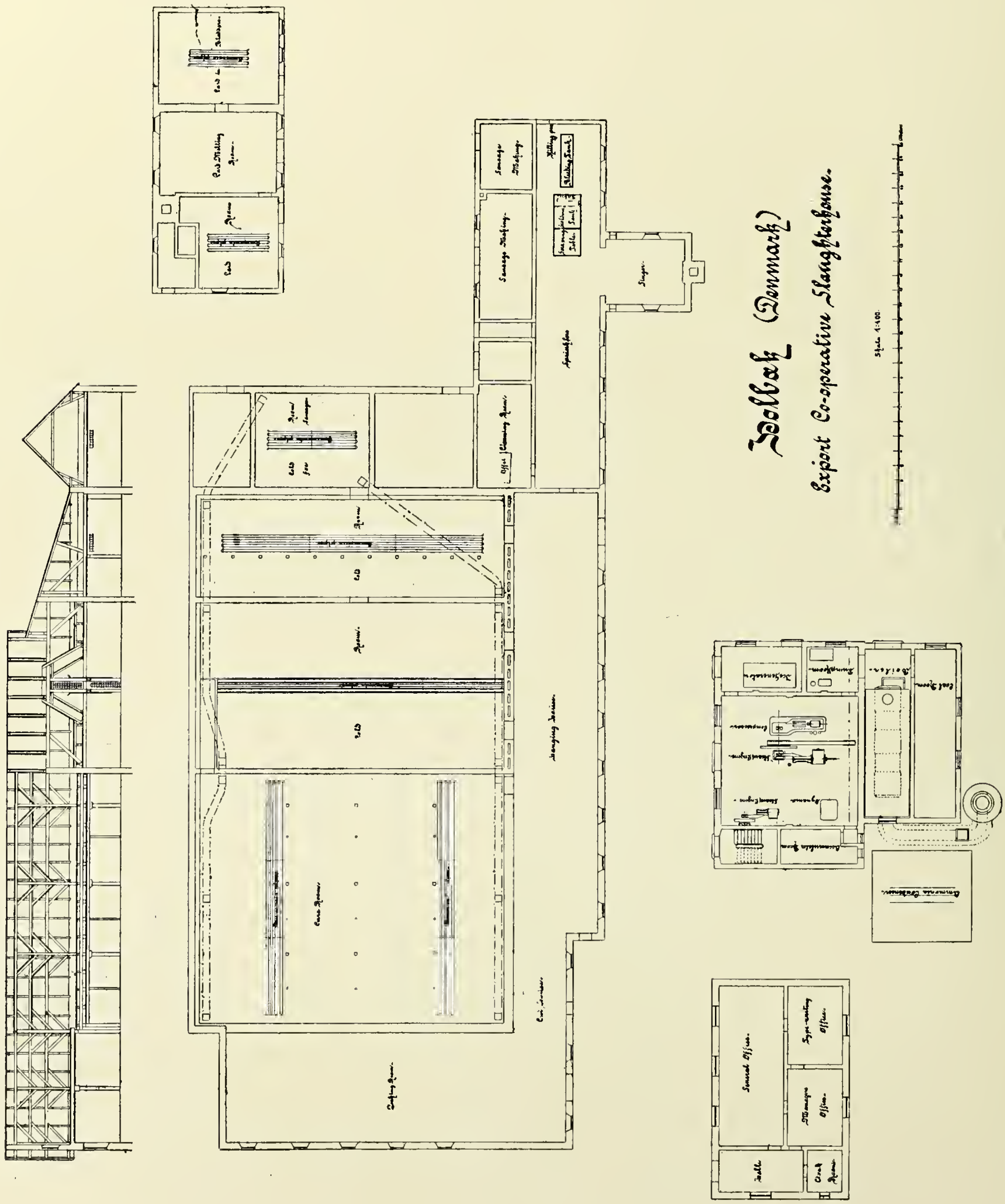
1. *Killing.*—Under this heading everything comes which is done to the hog from the moment it comes into the pig styes until ready for cooling in the open air. The hogs are driven in batches into the sticking pen, where a chain with a hook at each end is quickly passed round either of the hind legs, attached to a steam or hand hoist, and hoisted on to a bar which runs from the sticking pen right through the slaughter-house.

As soon as the hog is hung up it is stuck with a double-edged knife, 8 to 10 inches long, which is passed through the flesh of the throat and behind the breast bone, severing the aorta. Care is taken that the knife goes straight, and does not stick into either of the shoulders, and at the same time does not go far enough to touch the heart.

The sudden rush of blood partly stuns the hog, which is completely dead inside of two minutes, all the blood having run out of the carcase on account of the inverted position.

Farmers' Bacon Factory, Norre—Sundby, Denmark.

(A Danish farmers' bacon factory at Nörre—Sundby, which shows the general construction of these buildings. The roofs are very flat and the general form is that of a hollow square. The Danish bacon factories are generally worked on the ground level, one department following another.



Holbæk (Denmark) Co-operative Bacon Factory.

The carcase is then pushed along the rail down a "bleeding passage" until it reaches the scalding tank, usually heated with a steam coil, though in some places a large copper, heated by fire from underneath, is used. It is then pushed into the water, which is kept at a temperature of 150° F., having first been lowered on to a sliding table. Here it is repeatedly turned round, and kept well under water until the hair can be easily removed from the ears and trotters with the hand alone, it is then moved to the opposite end of the tank, where it is picked up by an iron cradle, working on the lever system, and thrown on to a scuttling table where the hair is all removed by men, with bell or cone-shaped iron or tin scrapers, standing at each side of the table. The hair when scraped off the pig is washed and dried, and finds a market in London. It is used for cheap bedding, pillow and chair upholstering, etc.

Some of the largest factories remove the hair after scalding by means of machinery. All the Danish factories remove the hair and outer skin by means of scalding. As soon as the hair is all removed the sinews of the hind trotters are laid bare by means of a double cut, and under these an iron gambrel and hook are passed. The gambrel is then hoisted up on to the rail, and the whole hangs by the hook, and is then ready to travel the length of the slaughter-house and the hanging room until cut up and trimmed.

The next operation is the singeing. This is done either by means of a gas shield, from which the burning gas issues forced by an air fan through a number of Bunsen burners, and which can be moved up and down, or by means of a coal furnace. In the event of the latter being used, a hook is fastened into the jowl of the pig and it is lowered into the furnace, coming out into a tank of cold water at the opposite side to that which it enters, and the gambrel is then inserted behind the sinews and hoisted on to the rail as in the former case.

The object of singeing the pig is to remove any remaining hairs, and to make the skin more durable, so that it will not so easily become slimy when salted, and to make it possible to remove a certain amount of the coarse outer skin.

The pig, when emerging from the shield or furnace, is entirely black and must be scraped clean. It passes under two or three water sprinklers and is scrubbed with a long handled broom, and is then scraped quite clean with oval-shaped scraping knives. It then passes under a final water sprinkler, and is ready to be opened. This is done by making one long, straight cut from between the hams down the belly to the opening made by the sticking knife, the next cut separates the aitch bones, and the bladder and internal organs of gestation are taken out. Next the crown end is very carefully cut out, and the fat gut loosened along the inside of the back, and the rest of the guts, stomach, and fat are all pulled out together. Great care is always exercised when cutting out the crown end, as these make a high price in Germany.

The guts are immediately passed into the intestine or gut room, where they are carefully pulled apart, all fat cut off them and hung up, the guts swilled out with water, and the chitterlings and bags or stomachs turned and thrown into cement tanks. The runners are each tied up in bundles, and hung up until they are salted.

As a rule the German contractors who buy the guts send their own men to clean and salt them.

The liver and kidneys are next cut out separately, and thrown into tubs of running water to wash and cool them. Then the breast bone is cut down on one side with a knife, or sawn straight through the middle, the knife is then passed round the skirt as close to the flake as possible, and the heart and skirt are cut from the lungs and thrown into tubs of running water in the same way as the liver and kidneys. The lungs and air pipe are drawn through the open breast bones, and cut off at the top of the tongue, though in some cases the tongue is cut out at the same time as the lungs and separated from them at once and thrown into tubs of running water, all depending on whether the heads can make a good price or not with or without the tongues.

(The livers and tongues, kidneys lightly salted, find a good market in Berlin.)

The flakes are then pulled out, and the whole inside of the carcase well swilled out with water. The next process is the marking down the back of the pig.

A straight cut is made, not too deep from the root of the tail, straight down to the back of the neck; the next cut is made down the right side of the backbone as close to the bone as possible, and the third down the left side of the bone in the same manner. When this is done there should be hardly any meat at all on the backbone, which now stands out clear from between the two sides. The pig is then weighed with the flakes and head, 3 per cent. being deducted for warm weight, the legs are cramped back with hooks or string in order that there may be a greater similarity of appearance, as also to give the flank a greater length and make the shoulder shorter.

If, earlier in the slaughtering, a cut has not been made across the gristle of the snout, it must be made now, as the blood which collects in the nostrils is by this time allowed to run out.

The pig then passes along into the hanging house, where the backbone is chopped completely out, broken in the middle, and hung over the gambrel. The flakes are likewise pulled out now, and hung up on hooks to cool, and the heads cut either quite off or so that they hang by the neck joint only.

2. *Cooling in open air.*—The hanging room is usually a very well ventilated place, with windows or shutters to open on two sides, or else a long passage covered over, and open to the north. Care is taken in summer that the sun be not allowed to shine directly on the skin of the carcases, as this will easily become hard and liable to crack under the proceedings which take place later on. As a matter of course the carcases must also be protected from the dry summer wind, which can carry the dust on to them, or dry up the skins too quickly. (The carcases hang here until next day). The floor of the cooling place must be clean, and preferably moistened with cold water. The object of this open air cooling is to allow the excess of animal heat to escape into the atmosphere, but great care must be exercised in winter so as not to permit the temperature to fall below 46° F.

3. *Cutting up and trimming.*—The greater part of the bacon exported from Denmark is trimmed according to the "Wiltshire cut," by which is meant whole sides, *i.e.*, shoulder, middle, and gammon all in one. The name "Wiltshire cut" originated in the county of Wiltshire, England, at which place this style of trimming was first adopted.

The head having been cut from the body as close to the jaw-bones as possible, the sides are taken off the gambrels,

and laid on tables the inside upwards. Here they are scraped, so that all the superfluous fat is removed and the bloody bits cut from the neck by the sticking hole; the hams and bellies are also trimmed, the steaks cut out, and the fore trotters cut off at, or sawn through, the knee joints. The neck bones and aitch bones are then cut loose as close to the bone as possible, the spare rib and breast bone going along with the neck bone, and the tops of the ribs are sawn off. The big vein in the neck is cut out, and as small a hole as possible is made in the shoulder through which the blade bone has to be drawn.

In order to withdraw the blade bone this must first be loosened in the side itself. This is done by means of a long, narrow chisel, which is inserted round the sides and on top of and under the blade bone. When the meat is fairly loosened, a thong is slipped round the head of the blade bone. This thong is attached to a harness, worn by the blade bone drawer. As soon as attached the man holds the shoulder, and pulls away from it, and the blade bone flies from its position in the side. A mechanical blade bone catcher is also used. Great care is taken not to tear the so called blade bone pockets, as it easily causes taint when the salting process takes place.

The art of trimming a side, for it is an art, cannot be minutely described, but the idea is to make the sides look as even and similar as possible. The greater art still is to trim a side well, and to cut as little offal from it as possible and yet make it look handsome. A quarter or half a pound taken from every side and added to the offal mounts up to a good deal on annual slaughterings of from 20,000 to 50,000. When the trimming is finished the sides are again hung up on the gambrels or on hooks, and are pushed into the chill rooms. If the sides are already cold enough to salt, this may be done at once, but as a rule they must hang for a time in order that the temperature may be further lowered until it reaches 42° to 45° F. inside the gammon and shoulder. This is ascertained by inserting a slender thermometer into the thickest part of the meat. As soon as the sides are pushed into the chill rooms, the men's attention is turned to the separating of the fat from the meat from the trimmings, the scraping of blade bones, cleaning of trotters and heads. In some places the heads and trotters are cleaned by machinery. The head and feet cleaning machine is a hollow cylinder of hard wooden spars, running on a centre axle, and driven by a pulley from the shafting or, it may be, driven by hand. There is a trap door through which the heads and feet are passed, shutting by means of a rod. A hot and cold water perforated pipe usually runs the length of the cylinder over the top of same, and when the cylinder is in motion the warm water dripping through the spars on to the revolving heads and feet causes the black outer surface to be easily displaced. The offal is usually all sold the day after killing, that which is left being kept in the chill room. Every factory has its regular customers—hawkers, who come with a small conveyance and horse and buy as much as they think they can dispose of.

The heads which are not sold are split either from the under jaw side or through the snout, and the brains taken out after having been chilled, and are thrown into a tank of strong pickle for twenty-four hours. This draws out any blood which may have settled in the mouth or nostrils. They are then pumped in the chap and eye-pieces and salted down in large cemented basins for two or three weeks, when they are ready for export. The unsold feet are also salted in tubs or tanks of brine.

4. *Chilling.*—The chilling process can be carried out by means of ice stored in a large room alongside of the chill room and bacon cellar, and having sliding trap doors which can be opened and shut at will, according as the temperature requires lowering or otherwise. This was at one time the universal method of chilling in Denmark, but the greater majority of Danish bacon factories now use other and better systems. Now, most factories have refrigerating machines, and the temperatures of both chill rooms and cellars can easily be controlled. Sometimes the supply of natural native ice has failed, and as a consequence the losses have been great owing to the fact that ice has had to be imported.

The refrigerating machines used are of three types, viz., with ammonia, carbonic anhydride, or sulphurous anahydride compressors. It is immaterial what machine is used so far as the effect is concerned, the whole advantage in the one type of machine or the other lies in the application. This entails not only a knowledge of refrigerating machinery, but a complete knowledge of the conditions suited for the production of the best bacon.

Experience has shown that still air alone in chill rooms is a mistake. There must always be a circulation of dry cold air as well as a store of brine in some suitable holder, such as pipes, brine walls, or brine drums, so as to take up the heat when the machinery is stopped. By having the systems arranged in duplicate, rapid cooling of the sides takes place, and the vitiated atmosphere of the chill rooms is continually renewed and freshened. When the excess of heat has been taken away, the machinery can be stopped, and the brine appliances will then absorb any heat that is left.

In the cellars a duplicate system of air circulation and brine storage is also requisite, not, however, for the same reasons. The atmosphere of the cellars should always be damp and humid, hence there need be no circulation of air. After prolonged use, however, cellars also become charged with a vitiated atmosphere. It is then that the circulation of air is necessary. It is only necessary for a short time, or until the prevailing atmosphere is sweetened again. Hence the utility of having both systems laid on to chill rooms and cellars alike.

5. *Salting.*—When the sides are sufficiently chilled they are pushed along the rails to the adjacent bacon cellars or curing beds. These rooms are called cellars, not because they are under ground for they are on a level with the outside road surface, but because every particle of daylight is excluded from them, the only light used being candle or electric light. Gas is neither used in the chill rooms nor bacon cellars, as an escape of it would be very liable to do great damage by causing taint. The walls are generally double, and fitted either with shavings or rice husks well stamped down. In some cases slag wool is used.

The process of salting consists partly in injecting pickle into the side, and partly of drysalting the same. The pickle or brine is mixed on many different principles as regards strength, and the quantity of various ingredients of which it is composed vary according to the ensuing treatment. Salt, saltpetre, and sometimes antiseptic are the chief ingredients. Most factories have some little peculiarity of their own in connection with their method of salting. However, as a

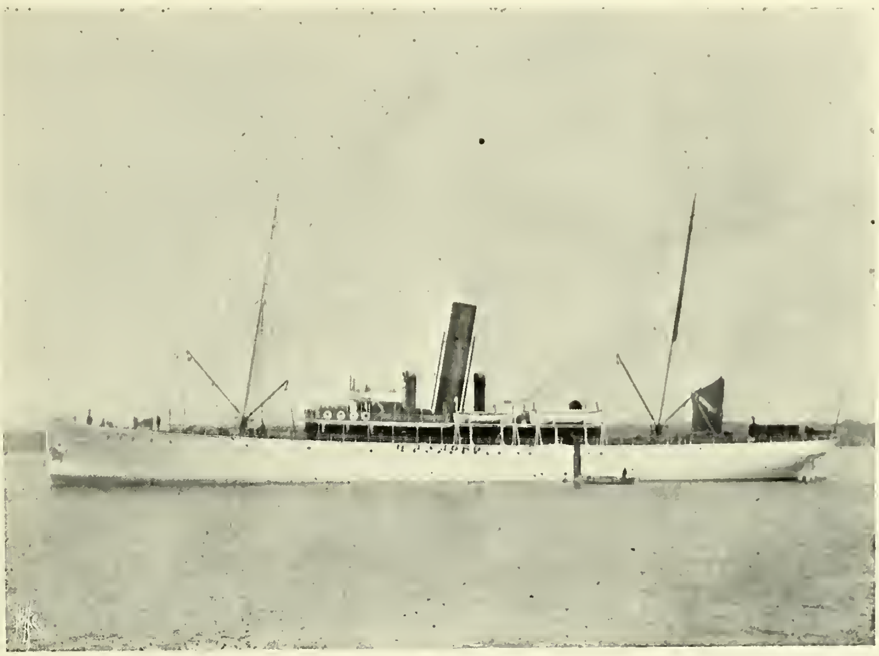
rule the general lines followed are nearly the same, and a pickle is used which tests about 100° on the Douglas salinometer.

Here is a recipe for pickle which is used in many places:—

100 lbs. of salt.
10 lbs. of saltpetre.
10 lbs. of cane sugar
(Only used in winter when fear of taint is minimised.)
10 lbs. of dry antiseptic.

This is made up to forty gallons with water, and sometimes boiled until clear. Oftener it is stirred until all is dissolved, then allowed to settle for twenty-four hours, when the sediment has all gone to the bottom. The clear liquid is then decanted off into a store tank for use. This store tank is kept in the cellar, and the pumps are fed from it there, the object being to maintain the temperatures of cellar and pickle uniform. Of course any quantity can be made from this recipe by multiplying or dividing as the occasion may require.

The pickle should test 100° on the salinometer, and if it varies from that figure salt must be added, or water, as it is weak or strong, until the correct degree is reached.



s.s. N. J. Fjord.

(This vessel is one of a fleet of many steamers plying between Denmark and England carrying butter and bacon. She brings on the average about 350 to 450 tons of bacon per week from Esbjerg to Harwich. There are eighteen steamers belonging to one company—the Steamship Company, Copenhagen—plying between Denmark and England every week. Four steamers bring to Harwich weekly an average of 900 tons of bacon).

The sides are laid on the salting table, and the back trotters sawn off at the hock joint. The blade bone pocket is then filled with as much dry broad salt as it will hold, care being taken that all the corners of the pocket are well filled. Then the brine or pickle is injected by means of a pump and needle.

The pump is worked at a pressure of between 40 and 60 lbs. per square inch. The needle is about ten inches long, and hollow, the top five inches are perforated on four sides, so that the pickle can escape through these small holes when the needle is inserted in the side. The number of sticks made in the side is from ten to sixteen, according to the method of salting, and these are distributed in the gammon round the bone, down the back, and in the shoulder and foreleg. When this is done a long, soft-haired brush is dipped in pickle and passed over the inside of the side, thoroughly wetting it, and filling the hollow of the ribs with brine; the side is then carefully carried to the curing bed, and laid down there inside upwards, and so fixed by means of staves that the pickle remains in the hollow of the ribs and has no access to the flank, as this last part will otherwise become too salt. The side is then given a fine sprinkling of saltpetre, and covered entirely with a light layer of broad salt. In this way the sides are generally piled alternately right and left, in some cases all right and all left, until they are eight high. This is considered the best number as regards height, though as many as twelve or fourteen sides are piled up when there is not room enough.

The process of salting being finished, the sides are allowed to lie in the beds for a period of from five to thirteen days, all according to the method of salting, strength of pickle, and other peculiarities of cure which cannot further be described. The most common is what is called an eight to nine days' cure. The temperature of the bacon cellar would be about 45° F.

When the cure is considered complete, the sides are "struck," *i.e.*, they are taken from the piles and thrown inverted on to a sparred-top low table or "horse," which process allows the pickle and salt in the hollow of the ribs and elsewhere on the side to drain and fall off. The pockets are then generally emptied of salt, this either being scooped out or washed out with some old brine from the pickle pump. The sides are then passed through an opening in the wall to the generally adjacent baling room where they are washed in a solution of water and antiseptic, and dried with wrappers, care being taken to remove all slime which may have settled in the creases of the flank or under the shoulder.

The cured bacon is now ready for export, and is sorted into the different selections required by the English agent, and packed four sides or six sides in a bale in wrappers according to weight.

The lard is generally rendered in a large copper heated by a fire the day after killing, although the large factories render it in steam jacketed pans. All factories, however, refine their lard with steam. The men in the lard room usually blow up the bladders, which have been allowed to lie in cold water all night, and clean them. They are then dried and salted until wanted. The lard is usually bladdered, or run loose into whole or half butter firkins.

Most of the Danish factories go in strongly for sausage making. There are always lots of bits and other meat which is specially adapted to be turned into sausages, and which it is difficult to dispose of otherwise. The Danes eat great quantities of raw smoked sausages of various sorts, which,

whilst looking and tasting very nice, often contain a mixed variety of ingredients less pleasing to the eye and nose in their crude state.

A destroyer or "Dumme Peter" is also to be found at most factories. This is a most useful and necessary apparatus, as by its aid all obnoxious and otherwise useless offal can be rendered into a sort of lard which is purchased by the soap factories. The blood and manure of the hogs are usually sold by contract at a certain amount per annum per hog killed.

Danish Bacon (*Side marked No. 1*).—This side of bacon is, in appearance at anyrate, as strictly lean and as perfect as a lean, sizeable side can be. There is plenty of middle and a very good belly. Neither is it too broad either at the shoulder or flank. In all probability a descendant of one of the large white Yorkshire boars imported to Jutland by Magnus Kjoer of Holstebro, and crossed once or twice with the Danish pig, so called "Land race" or country breed. This is a well-butchered side and well finished. The fat and lean are well proportioned.

(*Danish Bacon Side marked No. 2*).—This is by no means so good a side as No. 1, being rather short and much too broad at the shoulder and middle. The flank is also quite broad enough, and the belly is only of passable thickness. The back fat being very irregular makes it an unprofitable side for the curer or shipper, as the thickness of the fat at the shoulder is out of all proportion to the rest, which causes it to be sold as a fatter section than would otherwise have been the case. Possibly a cross between an imported Berkshire boar and a Danish pig of mixed breed.

Danish Bacon (*Side marked No. 3*).—This is about as bad a side of bacon as one could wish to see, being almost as bad as a "skinny" side, *i.e.*, a side having next to no back fat. It represents the lowest grade of bacon. The back fat is of a thickness only suitable for Manchester trade, but the extremely thin belly renders it useless for anything but seconds or unbranded bacon. Perhaps the most profitable way of getting rid of such a side is to cut it up for sausage meat. The pig is probably very badly bred and inbred. It is also a wide, ugly side, and the terror of all bacon curers, especially the smaller ones.

Danish Sausage Making.—The system of sausage making throughout all Denmark is totally different from the English, or, indeed, any other method. Sausages are used largely as *hors d' œuvres* by the Danes, and in slices are to be had in sandwiches at the principal railway stations. Amongst the poorer people sausages are much used as a staple article of food, and thus there is large consumption. Whether these sausages will ever become popular in the United Kingdom it is hard to say. In any case, an attempt to introduce them is being made by the Danish Government, who have recently sent a representative to England with that special mission.

It is little wonder that the Danish Government should be sanguine as to the introduction of sausages. Did not the bacon trade begin in the same unpretentious way? Now it amounts to 40,000 sides per week!

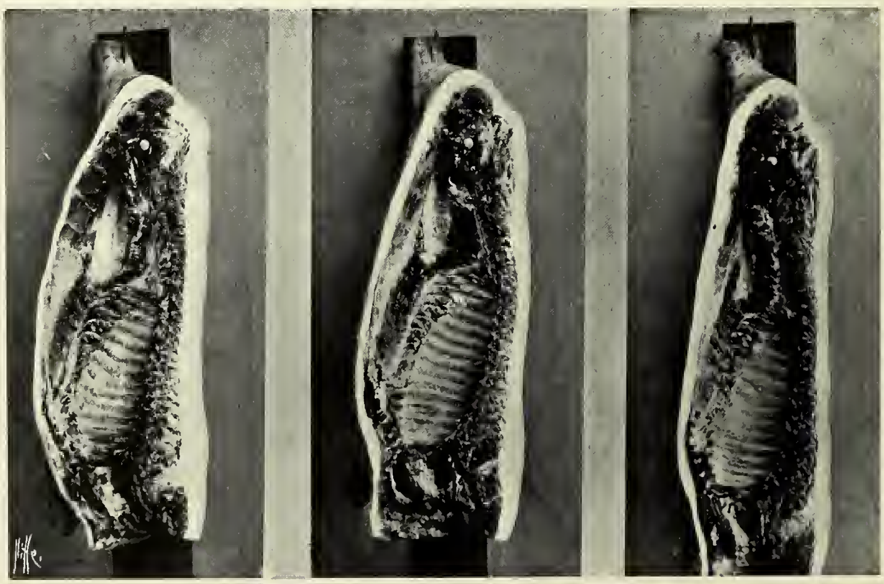
The following are the recipés for various sausages made. These recipés are in use in many factories in Denmark, and are jealously guarded as secrets of the mysterious trade. These recipés, notwithstanding, have had the advantage of being authoritatively verified, and may be relied upon as being accurate in every way.

1. *Spegepolse or Danish Smoked Sausage.*

50 lbs. beef,
50 „ pork,
24 „ fat, chopped fine,
16 „ fat, cut into small cubes,
5 „ fine salt,
60 gram. saltpetre (powder kali),
140 „ sugar (fine white powder),
170 „ fine white pepper.

This is perhaps the most used sausage in Denmark. It is always eaten cold or raw cut in very thin slices on bread and butter. All sinews having first been extracted from beef and pork, especially the former, they are chopped up together, and when about half chopped the fat is added, as also the spices.

When the whole is fairly finely chopped and well mixed together, it should be packed tightly in a wooden trough for twenty-four hours, as this allows the saltpetre to colour it better and renders the mass firmer. The meat is then placed in the sausage filler, and filled into ox or horse runners *as tightly as possible*. The tighter the skin is filled, the better the sausage will be for cutting when dried. As soon as the skins are filled, they should be laid down in a pickling vat and lightly covered with coarse salt. Boards



No. 1 No. 2. No. 3.

Typical Sides of Danish Bacon.

should then be placed on the top of them and they must remain there until all the salt has turned to pickle, when they are taken out and hung up to dry in the air, *i.e.*, until all moisture runs off them. As soon as they are dry, they should be smoked in cold smoke until they are a rich, dark brown colour. The sausage is then ready for eating, and will keep several months. Length about 18 inches.

2. *Cervelatpolse, or Danish Beef and Pork Sausage.*

50 lbs. beef,
50 ,, pork,
25 ,, fat (back) in cubes, size
3 ,, salt (fine),
60 gram. saltpetre (powder kali),
100 ,, pepper (fine white),
100 ,, sugar (fine white powder),
25 ,, ginger ,, ,,
25 ,, nutmeg (grated).

Meat to be carefully sinewed as No. 1, and beef and pork then chopped together quite fine. When chopped, place in power mixer and mix spices and fat cubes well together. A couple of gallons of pure water can be *dribbled* into this mixture if done very slowly. When mixing is done, meat to be filled hard into ox runners and let hang for twenty-four hours. Smoke in very warm smoke till skins are brown, and then boil at once until sausage is about as elastic as an indiarubber ball, and will hop if let drop on the table. This is an absolute proof that the sausage is cooked through. Skins then to be painted with red varnish; length 18 inches. Sausage is eaten cold, thin slices as No. 1.

3. A cheaper sausage of same name as No. 2.

75 lbs. horseflesh,
25 ,, veal,
10 ,, potato meal, with as much water as it will hold.

Spice and otherwise treat as No. 2.

4. *Knockpolse or Hard Smoked Danish Sausage.*

(*a*) 40 lbs. beef,
10 ,, back fat,
25 ,, pork,
25 ,, veal,
2½ ,, salt (fine),
60 gram. saltpetre (powder kali),
30 ,, nutmeg (grated fine),
40 ,, cinnamon (ground fine),
40 ,, ginger ,, ,,
120 ,, pepper (fine white),
8 eschalots (very small white onion) grated fine with a little salt (fine), or 8 garlic cloves.

First chop beef and veal together half fine, then add pork, and when the whole is fairly finely chopped, throw in fat. Continue chopping until fat is cut into small cubes about this size The whole should then be thoroughly mixed in power mixer where spices are added. The whole then to be filled into hogs' runners and divided into sausages about 6 inches long, meat not to be filled too tightly. The meat need not be as carefully sinewed as Nos. 1 and 2. When filled, hang to dry for a day and smoke in warm smoke. Boil for eating warm or cold.

(*b*) A much cheaper sausage than No. 4 (*a*), but of same name.

Made up of bloody bits, small meaty muscles and any refuse not good enough for first or second class goods. Otherwise same treatment and spices as No. 4 (*a*).

5. *Wienerpolse or Bayerskepolse* (Vienna or Bavarian Sausage).

50 lbs. pork,
25 ,, veal,
25 ,, back fat,
2½ ,, salt, fine,
60 gram. saltpetre (fine kali),
60 ,, coriander (fine ground),
100 ,, sugar (fine white),
120 ,, pepper ,, ,,
4 garlic cloves grated fine with a little fine salt.
8 eschalots grated fine with a little fine salt.

Only the best meat must be used for this sausage, and there must not be the slightest vestige of a sinew in the meat, as it is a great delicacy. The meat to be minced together first, and the fat to be so done afterwards. Mix the lot together, spices and all, in power mixer, and then fill into lambs' runners loosely. Divide into sausages of 5 inches length (links). Let them hang a day, and smoke in warm smoke until of a bright brown colour. Boil five to eight minutes, when they are ready for the table.

6. *Leverpolse No. 1 or Liver Sausage No. 1.*

1 fine large liver (pig's),
10 lbs. veal, (belly, neck, and legs),
10 ,, pork (breast or belly),
7–10 ,, fat (good belly fat or soft back),
3 ,, fine salt,
40 gram. thyme (powdered),
50 ,, nutmeg ,,
50 ,, ginger ,,
60 ,, marjoram ,,
140 ,, pepper (fine white),
5 lbs. fine pork.

N.B.—4 small onions in winter; *none* in summer, as they easily cause acidity.

Having extracted all sinews and gristle from pork and veal, boil them and mince together. The fat to be cut into small cubes; the liver to be skinned, and the thick veins removed and to be boiled in the boiling broth for from five to six minutes. Then chop it a little, add a little salt, and mince quite fine. Now throw the minced veal and pork, fat cubes and liver into the mixer along with 5 lbs. minced *raw* fine pork. Now add spices and a cooking-spoonful of the broth with fat floating on top of it, if possible, and mix well together. Fill into hogs' fat guts, not too hard, as the liver expands in the cooking which follows; avoid curly guts; length, 18 inches. Then boil the sausages in boiling water for fifteen to twenty minutes, wash them, and lay them on a table to cool. The sausages are then ready for the table, cut in slices cold. Are also used fried in slices warm. This sausage can be smoked in cold smoke in winter, and keeps well.

N.B.—The onions to be mixed with the liver in winter only whilst it is being chopped.

7. *Leverpolse No. 2* (*Liver Sausage No. 2*).

A cheaper sausage than No. 1.

25 lbs. liver (any sort),
75 ,, meat, sheep, ox heads, udder, tripe, hearts, lung, kidneys, and fat.

Spice as No. 1.

Treat same as No. 1 as regards mixing and boiling. Fill into ox runners.

Leverpostej (*Liverwurst or Danish Liver Sausage*).

10 lbs. flare fat,
3 or 4 livers according to size,
4 to 5 lbs. cut pork meat, free from fat,
10 eggs,
6 to 12 anchovies according to size.

Add pepper, salt, nutmeg, and cinnamon to season according to taste; fill in bullocks' runners; boil two hours.

There are thousands of these sausages sold in Denmark.

Bacon Curing Powder.—A specially manufactured compound, which assists in the curing of bacon, hams, tongue, and other meats. When bacon gets slimy, it is generally due to either softness of the meat or improper chilling. The best remedy for it, then, is to treat it with bacon curing powder so as to destroy the slime. But the powder can be used as a primary curing agent similar to salt. Equal quantities of granulated saltpetre and the white powder are mixed together and dusted on the meat when it is laid down to cure. The salt is then laid on in the usual way. For use in pickles, so as to preserve their sweetness, 5 lbs. of powder is added to 20 gallons of pickle.

Bacon (Days in Salt).—Data from Wiltshire.

7 to 9 score pigs	-	9 days in salt
9 ,, 10 ,,	-	11 ,,
10 ,, 11 ,,	-	12 ,,

In winter, one day less would do.

Use about four handfuls of salt to each side. Strike it at the ends named, and let it remain nine days more—that is, until twenty-one days old, and then get out and wash. Put up in piles, or next day put in stoves to dry.

Bacon Factory.—see Yorkshire Bacon Factory, also Somersetshire Bacon Factory.

Bacon Factories in Tasmania.—see Tasmania.

Bacon Factories in Western Australia. — see Western Australia.

Bacon Factory Books.*—Two books are essential in every well-conducted bacon factory. They are entitled the "Quality Book" and the "Log of Chill Rooms and Cellars." These books serve to clearly indicate the progress of the cure, and also show under various headings what kind of bacon is being turned out. The "Log-Book of Chill Rooms and Cellars" is simply a record of the temperatures and humidity in the two departments taken at certain regular hours.

Bacon Imports.—see Live Stock and Meat Imports.

Bacon in Canada.—see Canada.

Bacon in Queensland.—see Queensland

* Published by William Douglas & Sons Limited, Putney, London, S.W.

Bacon in Victoria.—see Victoria (Australia).

Bacon Scale.—see Weighing Machines.

Bacon Statistics.—see Pig and Bacon Statistics.

Bacon Testing Thermometer.—see Thermometers.

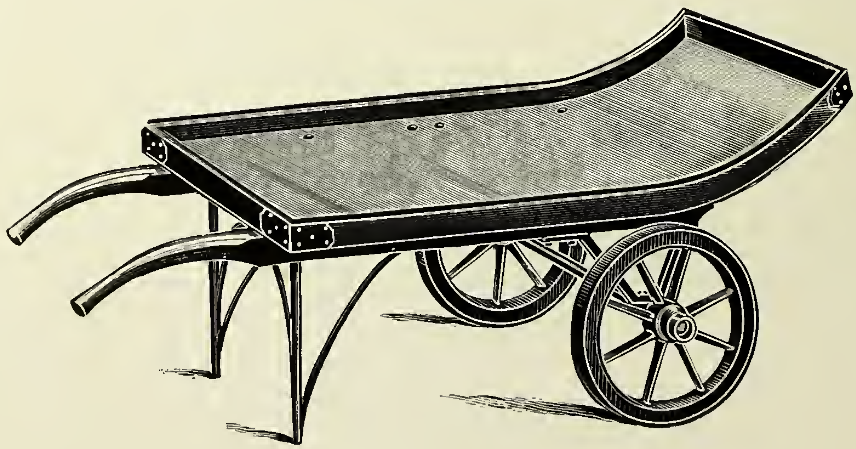
Bacon Trier.—A sharp-pointed instrument, varying in length from 6 to 12 inches, and used for "trying" meats of all kinds in the manufactured state, such as ham, bacon, corned beef, tongues, and all salted and pickled meats. The trier

Ham, Bacon and Meat Trier.

is pushed into a fleshy part or parts of the meat, and is withdrawn at once and smelt. If the meat is tainted, the taint can be readily smelt on the trier. In order to preserve cleanness and to get rid of the smell should any taint be encountered, the trier is kept stuck in a bag of fine ground shellings, or may occasionally be inserted into a little bag of lime and well wiped. It must be noted that when the trier is withdrawn from meat it leaves a small hole which should be invariably, and without exception, closed with the forefinger immediately, so as to exclude the air from the hole.

Bacon Truck.—The trucks for transporting bacon in factories should be strong and well made. The frame should be of hard wood, bound with iron; the wheels, to be durable, should be fairly heavy. The breadth should be such as to permit of two sides lying alongside of each other, and the length should be a little longer than the sides so that they do not project or hang over. The back part of truck should be raised to counteract the tendency of the sides to slip off when the truck is in motion.

Bacteria.—It is now an established fact that decay or putrefaction is due to the multiplication of micro-organisms or forms of life invisible to the naked eye. Many investigators have, during the present century, thrown much light on these obscure forms, and it may be confidently hoped that



Factory Bacon Truck.

before many years have passed that we will be able easily to arrest their formation altogether. In meats, fresh and cured, the process of quick decay is too familiar; and while many means of modifying the process are available, it is yet, to a great extent, a field of investigation open to whoever will undertake the task. A curious calculation is made by Cohn, who was one of the earliest investigators. He says:

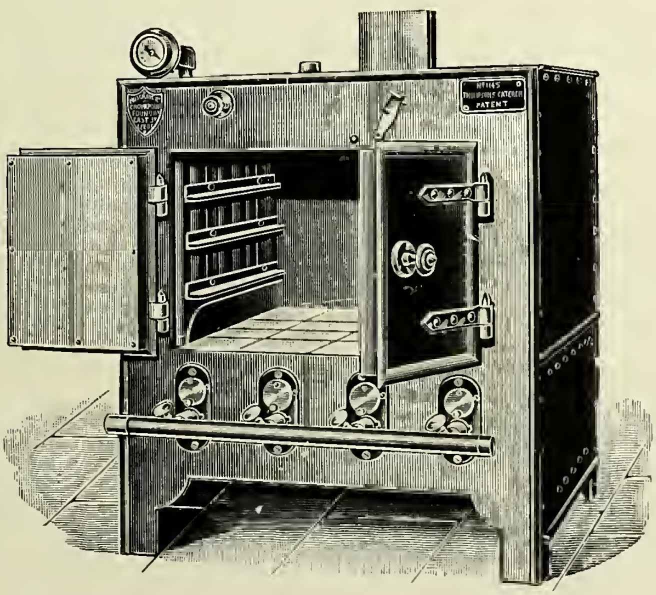
"Let us assume that a microbe divides into two within an hour (a fact determined by observation), these two into four in the next hour, these again into eight in the third hour, and so on. The number of microbes thus produced in twenty-four hours would exceed $16\frac{1}{2}$ millions; in two days they would increase to 47 trillions, and in a week the number expressing them would be made up of 51 figures! At the end of twenty-four hours the microbes descended from one individual would occupy $\frac{1}{40}$ of a hollow cube with edges $\frac{1}{25}$ of an inch long, but at the end of the following day would fill a space of 27 cubic inches, and in less than five days their volume would equal that of the entire ocean.

A single bacillus weighs 0,000,000,000,024,243,672 of a grain (a perfectly incomprehensible quantity); 40 thousand millions, 1 grain; 289 billions, 1 pound. After twenty-four hours the descendants from a single bacillus would weigh $\frac{1}{2000}$ of a grain; after two days, over a pound; after three days, $16\frac{1}{2}$ million pounds."

Of course the calculations are made on the presumption that no obstacle will arise in the progress of development—a thing happily quite impossible.

Pasteur demonstrated that all putrefaction was due to the presence of bacteria in the air, and that blood, milk, meat, etc., is not affected when deprived of contact with the air. This process is described as *sterilizing*.

Baking Ovens (for Gas).—These are built either in what is known as double or single deckers. The double decker is simply two ovens in one, and, of course, gives double capacity. They bake or cook all kinds of pies, joints, and



pastry, and are equally good for making bread. They put an excellent bloom on pastry, and the oven illustrated is one which effectually keeps the fumes from getting inside and thus spoiling delicate goods.

Baking Powder.—see Bi-carbonate of Soda.

Balances.—see Weighing Machines.

Bar Hooks.—see Hooks, etc.

Barley.—A cereal which grows best in a moderately dry climate and flourishes particularly in Germany, and at an elevation of between 3000 and 4000 feet on the Alps and on the mountain ranges of the Himalayas, 14,000 feet above sea-level. It is also largely cultivated throughout Europe, the eastern counties of England, and the Lothians and some of the northern counties of Scotland. The chief use it is put to is conversion into malt for the making of beer, but at one time it was largely used for human food In the reign of Charles I. it almost entirely took the place of wheaten flour as a food among the people in the north of England, and in some districts in Germany it is still largely used in the manufacture of bread. To a moderate extent in the north of Scotland, and in some parts of Ireland, it still bulks largely in the food of the people—some of the fishermen in the smaller islands off the coast being unable to use any other flour or meal than barley meal. Stripped of the husk it is always a constituent in Scotch broth, and is then known as "pot barley." The common form as used by pudding manufacturers is the well-known polished and rounded "pearl barley."

Bars.—Bars are a necessity to every butcher, and they are made in great variety. For ordinary shop purposes the regular sizes are $1\frac{1}{2}$ inches by $\frac{3}{8}$ inch, 2 inches by $\frac{3}{8}$ inch, and 2 inches by $\frac{1}{2}$ inch. They may be obtained black, bright, or galvanised, and to special order they are also made plated. The last-mentioned are very effective in appearance, but being so much more expensive than the others are not so much used.

Barwood.—see Camwood.

Basil.—see Culinary Herbs.

Basket for Cooking.—see Cooking Basket.

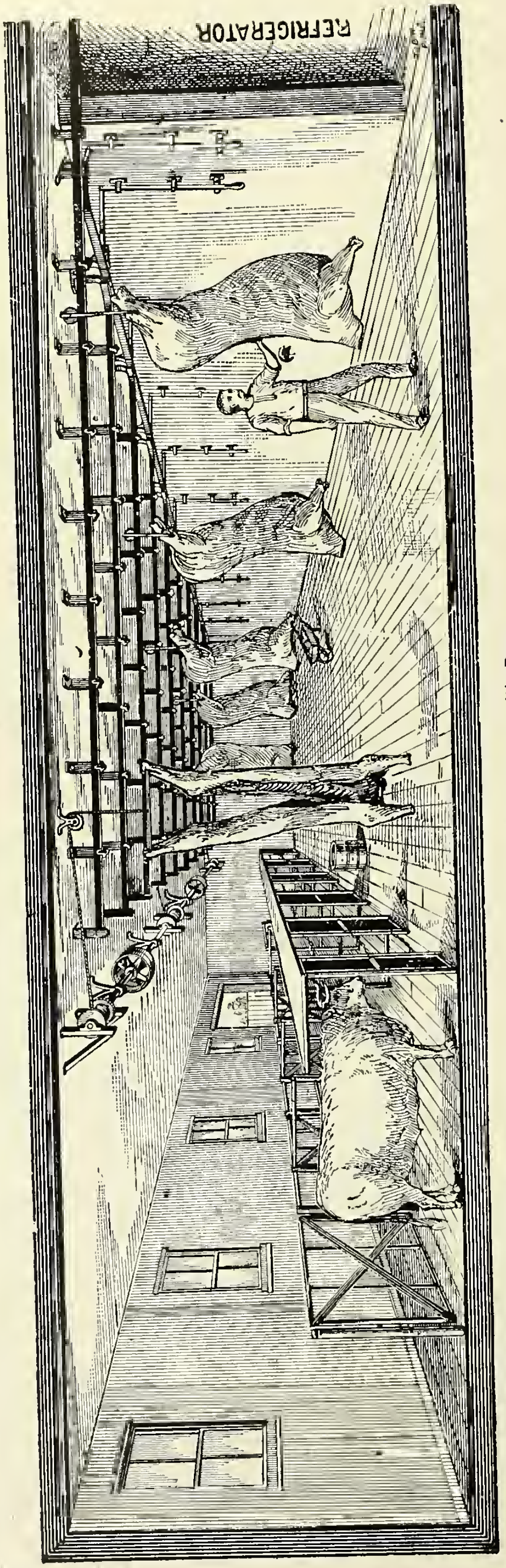
Bavarian Sausage.—see Bacon Curing in Denmark.

Bayerskepolse.—see Bacon Curing in Denmark.

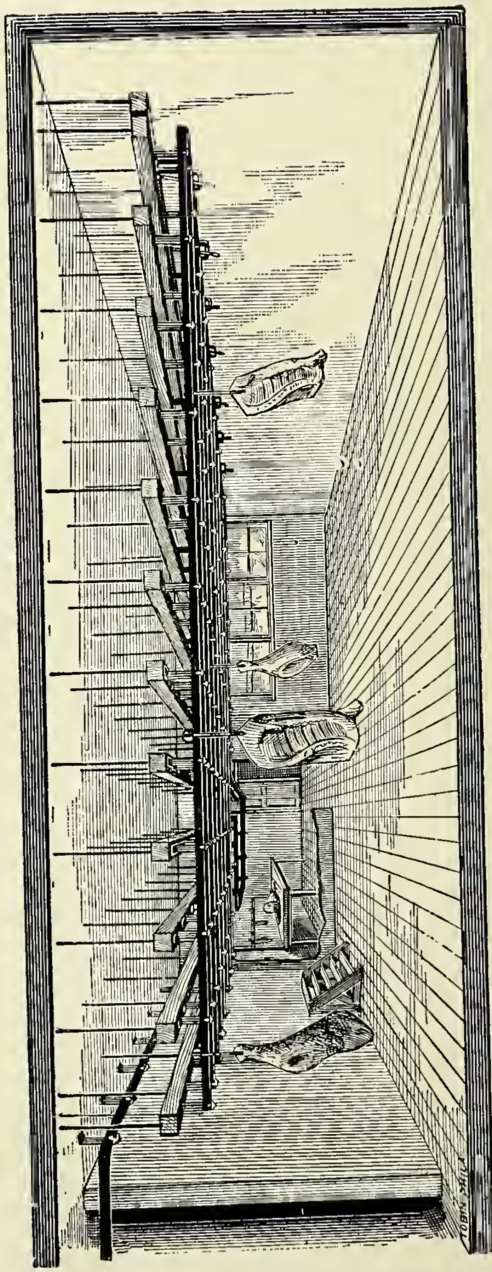
Bay Leaves.—see Culinary Herbs.

Bayonne Meat.—Take a piece of pork from the neck to the sixth rib; bone it, take the fat and rub it well with fine salt. Cut in pieces and lay in a pickle tub, putting a handful of salt between each layer. Then pour over the piece enough aromatic brine until it is an inch above the meat; cover them, and let them stay in the brine from eight to ten days. Take them out, and let them lie on the top of each other for four or five days to get tender. Now make them round with the hand and then remove.

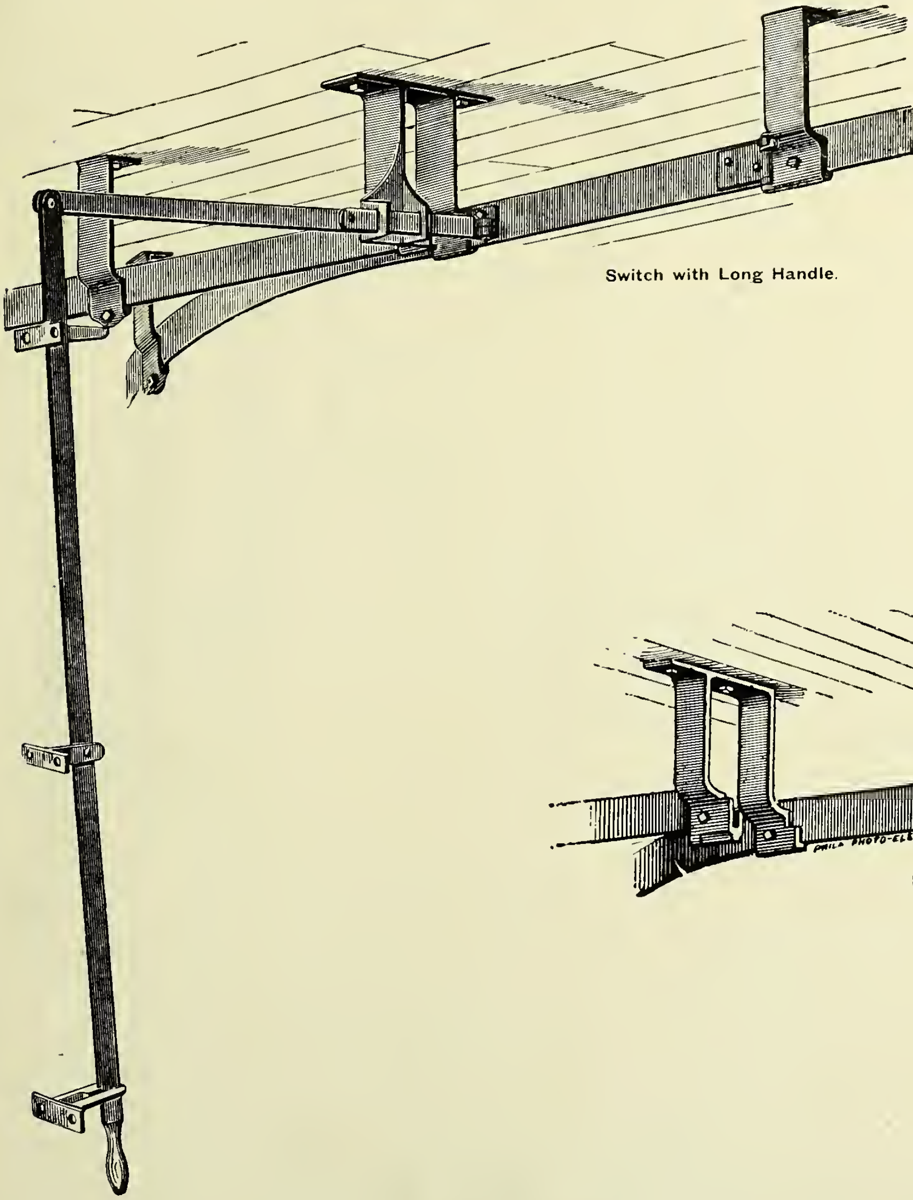
Beef and Pork Sausage (American Recipé).—Use 75 lbs. of beef, free from tendons and veins, wipe dry with a clean cloth, and after being partly chopped add 25 lbs. fat pork. Chop until very fine, season with 30 oz. of salt. Mix well, and stuff into beef middle casings. Dry in the open air until they have become hardened They can easily be kept for a year. See also Cervelatpolse.



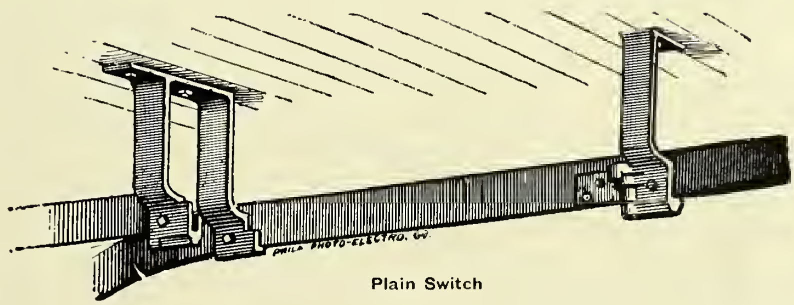
Cattle Hanging House with Bars.



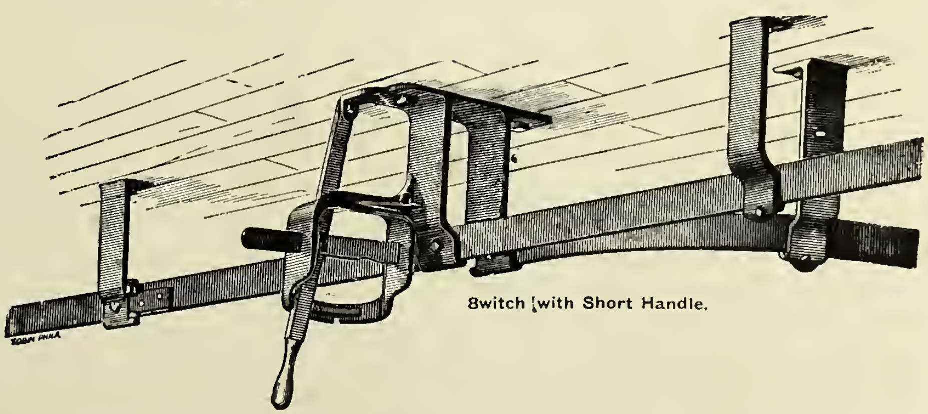
Hanging Hooks.



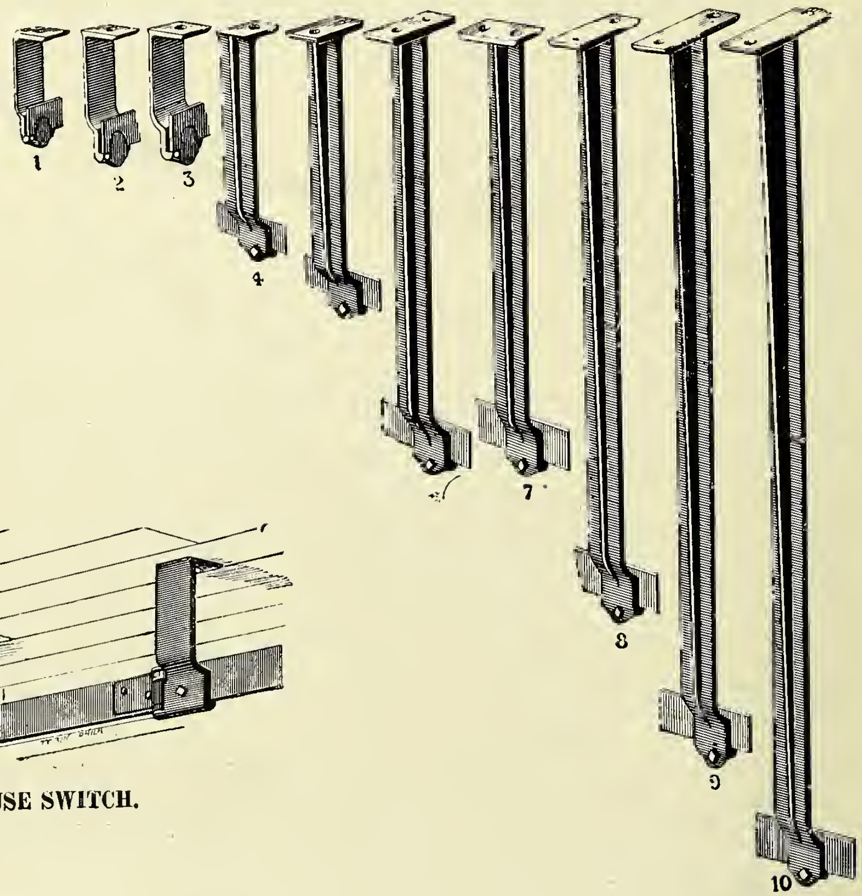
Switch with Long Handle.



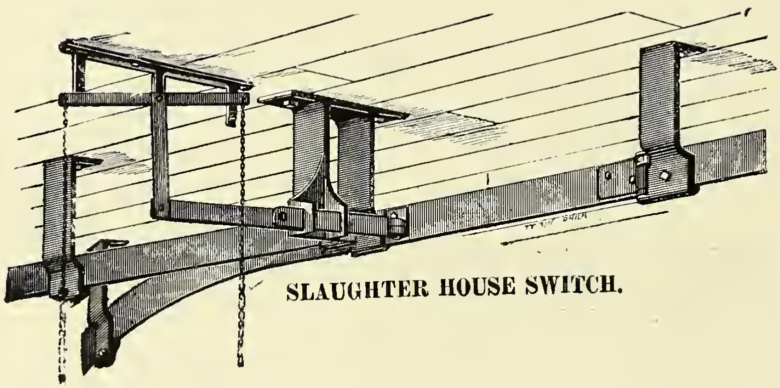
Plain Switch



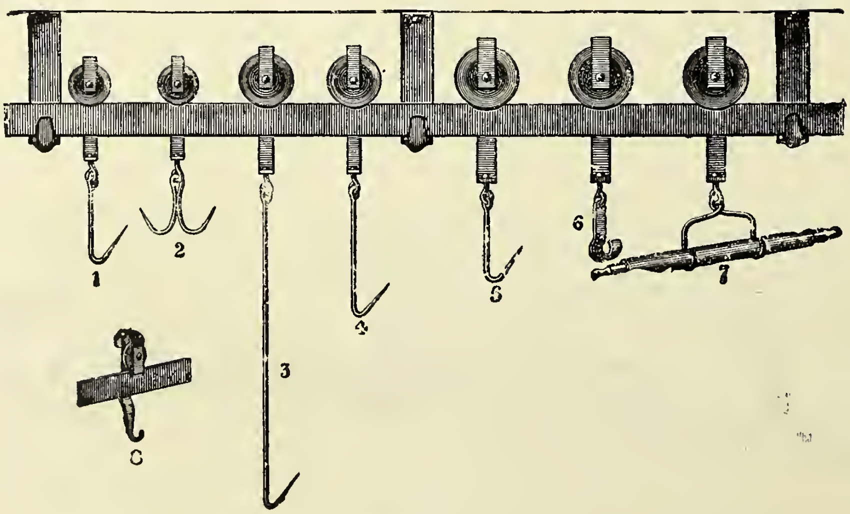
Switch with Short Handle.



Hangers.



Worked by Rope.



Hanging Hooks.

Beef and Tongue (Special) in Glass Moulds.—Required—pigs' tongues, beef briskets, flat ribs, flanks, etc

The tongues must first be well washed, freed from all saliva, and then immersed with the beef in the following pickle:—A liquor of salt and water is first made, and the scum, as it rises to the top, thoroughly skimmed off. The strength should be 70° on Douglas's Salinometer. Weigh to each gallon of pickle required, 1 oz. saltpetre, ½ oz. dry antiseptic, ½ lb. moist sugar, ½ oz. black peppercorns, ½ oz. white peppercorns, ½ oz. Jamaica peppercorns, ¼ oz. Cayenne pods. The peppercorns and Cayenne pods should be tied up in a muslin bag and with the saltpetre, dry antiseptic, and sugar, put into a stewpan with about a quart or so of water, and brought to the boil, stirring until the saltpetre, etc., are thoroughly dissolved. Add the whole to the pickle, and stir the same well. Allow to cool, and it is then ready for use.

The pigs' tongues and meat will require from fifteen to eighteen days in pickle, when they are taken out and well washed and then cooked. Sufficient rinds, pigs' feet, or any other available jelly-making constituents should be added, or, if not available, add sufficient gelatine to make the liquor into a firm jelly when cool.

When properly cooked it is all taken from the kettle, the latter is wiped clean, and the liquor part strained back into it through an ordinary horse-hair sieve. The meat is sliced thin and crosscut into pieces of from one inch to an inch and a half in size, and put back into the kettle. The tongues are skinned and sliced neatly into longitudinal slices, and placed round the sides of the glass moulds in the most attractive way possible. Then the contents of the kettle are poured in to fill up the mould. The moulds are then put into a cool place to set. When thoroughly set, a thin layer of hot lard is poured on the top, and the mould covered up and labelled, or they can be hermetically sealed by using a canning vat.

Beef (Braised).—see Braised Beef.

Beef Bungs.—see Bungs (Beef).

Beef Cervelat Sausage.—Use fresh lean beef (100 lbs.) from which all the blood has been thoroughly drained, dry with a clean cloth. Then add 30 lbs. of fresh, fat pork, chop together finely, and mix with it 35 oz. of salt, 3 oz. ground saltpetre, 35 oz. ground white pepper, and 1 oz. whole white pepper. Stuff tightly into beef middles, tie into sausages 10 inches long. Hang in an airy place for eight days, then smoke for six days. In winter, if exposed to the air, they will keep six weeks without smoking. A beautiful red colour may be given to Cervelat Sausage by heating the salt and saltpetre together, and adding to this mixture ½ oz. cochineal. Reduce all to a fine powder before mixing with the meat. If the sausages are too light in colour, it may be inferred that the meat is of an inferior grade.

Beef (Dried).—Rub the pieces with salt, saltpetre, and pulverized sugar. Cover with a very strong brine, let them remain for three weeks, then take out, hang in the air for four days, and smoke for a week. These can be kept for any length of time.

Beef Points.—If young and freshly killed, the meat should be ingrained with streaks, dots and pieces of suet throughout it.

If the animal is healthy and cool when killed, the suet will be very firm, white, dry and crumbly. The lean or ox beef will be a dark red when first cut, changing to a bright or cherry colour on exposure to the air, due probably to its juices coming to the surface. Should be juicy, firm and somewhat elastic, smoothly grained and velvety to the touch.

Heifer beef is more closely grained and perhaps less bright in colour, the bones smaller, and the suet a purer white. The meat of a lean animal is inferior. If the fat is yellow, oily or fibrous, it is not prime beef. Too much fat is wasteful in trimming. Bull beef is the coarsest and most rank in flavour. It is known by its darker colour, close, tough fibre, and the bad odour of the fat. A bluish colour denotes poor beef. A pale, moist muscle indicates a young animal, a deeper hue an older one. The age for prime beef is from three to six years old. A steer will average 800 pounds, a heifer 500. Twenty per cent. of the animal can be counted as bone. Beef is best during the winter and spring, after being grain or stall fed. Grass fed beef may be juicy and tender, but it lacks the flavour of grain beef, and is less solid. Grain or stall fed beef shrinks less in cooking than grass fattened animals. The latter are seldom salted down.

Work oxen when fattened make better beef than the steer that has always been fat. The meat on those parts of the animal where the muscles are least called into action are the most tender and succulent. Beef should be kept some time before it is cooked to allow it to ripen. A month in the winter time will greatly improve it, and as long a time as is possible in the summer, if kept in a cooler or cold storage where an even temperature can be maintained. If meats are beginning to spoil, it can be readily told by thrusting a knife into the bone, a decided odour being on the knife blade. Meats that have been frozen lose much of their flavour, though they become more tender. Cooling-rooms should be built to avoid freezing or bringing the meat in contact with the ice, and should aim to keep it at as high and dry a temperature as is possible. Freezing meats hastens decomposition after it sets in. Fresh beef shrinks about one-fifth in cooking. When meats have shrunk in hanging impress upon your customers the fact that they will shrink less in cooking. Food Preservative (dry antiseptic) will preserve cut pieces a long time. The hind-quarters have more meat in proportion to the bone, and should bring a much better price, though some claim that the meat from the fore-quarters is more juicy and delicate in flavour. The best steaks are cut from the middle of the rump, and may weigh as much as four pounds when properly cut with the bone and fat. (Trimming somewhat reduces this.)

A good steak should be cut one inch thick from a piece of beef that has been kept at least ten days in a cooling-room, and should never be pounded. The orthodox Hebrews never eat the hind quarters of an animal, as it is forbidden them by their religion. The ribs, sirloin and rump are the best pieces for roasting. The round, buttock, edge bone, shin, brisket, shoulder and clod are all excellent stewing and boiling pieces.

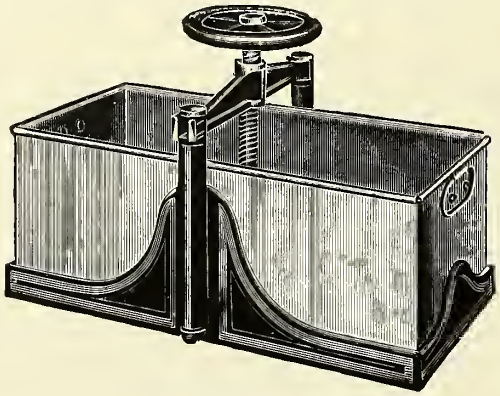
To prevent meats that flies have touched from spoiling, rub with a little vinegar, drying immediately after.

Meats contain from 5 to 10 per cent. of fat.

Eggs	12	per cent.
Milk	3	,,
Butter	80 to 90	,,
Cheese	8 to 30	,,
Almonds and Nuts	53 to 66	,,

And all vegetables traces of fat sometimes as high as 3 per cent.

Beef Press.—This apparatus is essential for those who press beef, bellies or briskets. The illustration shows the working of the machine at a glance. The pressing plate is screwed up close to the cross-bar, and then the cross-bar and plate are both turned clear of the tin box. The meat to be pressed is then put in and the pressing plate brought back into position, when by merely manipulating the wheel attached to the screw any degree of pressure can be applied.



Beef, Belly and Brisket Press.

Beef Sausage.—

12 lbs. lean beef (a bullock's heart or melt may be added in place of same weight of meat),
8 ,, fat,
4 ,, pressed bread,
4 ,, sausage meal,
14 oz. No. 1 beef seasoning,
2 ,, food preservative (dry antiseptic),
about 3 ,, rose-pink colour.

Where it is preferred to compound the seasoning at home, the following may be used:—9 lbs. salt, 7 lbs. ground white pepper, 8 oz. ground coriander seed, 2 oz. sage (if desired)

Cut the beef and fat into squares of about 2 to 3 inches in size, and mix in the pressed bread on a table. Put into machine, and cut moderately fine. Add the sausage meal dry, and if the mixture becomes stiff, add water until the proper consistency is obtained. If frozen meat is used, the sausage meal should be added very slowly, so as to allow of its taking up the moisture eliminated from the meat. The other ingredients are then added, and the whole chopped very fine.

Beef sausages are usually filled into sheep casings, but narrow pig casings will do quite as well, so long as they do not show veins. They are very much more reliable and less costly than sheep casings.

Beef Sausage (Another Recipé).—

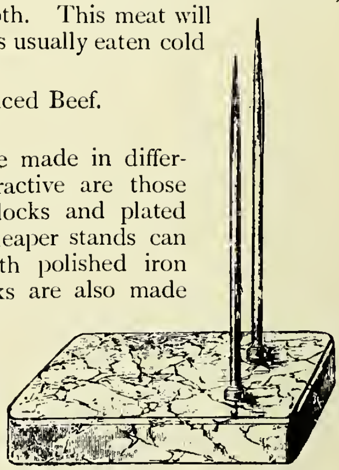
12 lbs. beef,	10 oz. salt,
8 ,, fat,	$3\frac{1}{2}$,, pepper,
10 ,, bread,	$\frac{1}{2}$,, ground nutmeg,
3 ,, sausage meal,	2 ,, dry antiseptic.

Less bread and more sausage meal may be used if preferred, and "pansitose" may be used instead of sausage meal. Where customers prefer to use made-up seasoning, then instead of salt, pepper and nutmeg as above, use $1\frac{1}{4}$ lbs. No. 1 seasoning.

Beef (Smoked).—Boil the beef in water for five minutes, stirring continually, then rub with salt and saltpetre which have been previously heated together. Place in a vessel for twenty-four hours, and at the end of that time turn the meat over and let it remain on the other side for twenty-four hours; smoke for forty-eight hours. To the brine already used add the necessary water, and cook the meat in it for three hours, allowing it to cool in the broth. This meat will keep for several weeks, and is usually eaten cold

Beef (Spiced).—see Spiced Beef.

Beef Stand.—These are made in different styles. The most attractive are those made with solid marble blocks and plated spikes, as illustrated, but cheaper stands can be had made of wood with polished iron spikes. Some of the blocks are also made from thin marble slabs pieced together similar to the wood blocks, but these are naturally not so strong and lasting as the solid marble blocks.



Beef (to corn).—see Corned Beef.

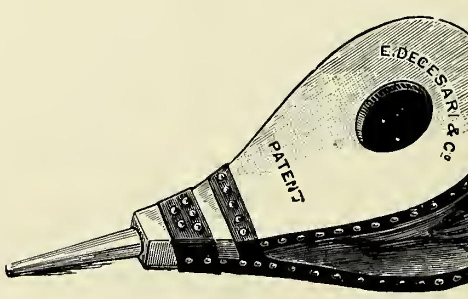
Beef (to cure).—see Curing Beef.

Beef (to pickle).—see Pickling Beef.

Bell Pig-Scraper.—see Scrapers.

Belly Press.—see Beef Press.

Bellows for distributing Powders.—This is a most ingenious apparatus, and is simply invaluable to every one connected with the meat trades, as it dusts on in fine layers all kinds of powders. The contents can be distributed in large or small quantities at the will of the operator, and as it only requires one hand to work it and will discharge the powder at any angle, it requires no further recommendation.



The inventor was Mr E. Decessari, an Italian, and so useful an invention has it been that it has come into general use for distributing insect killing powders, dusting poultry and distributing insecticides in poultry runs. The apparatus is also used by nurserymen, florists, vine-growers, sculptors, wood-carvers, pigeon and bird fanciers, dog fanciers, fur merchants, and for endless different uses in the manufactory, warehouse and private residence.

Belting.—For conveying power from a revolving shaft to another shaft or to a machine, or from prime motors to shafting or machinery, it is necessary to have pulleys and belting. Where an exact transfer of motion is requisite belting will not do, as there is a certain loss through slipping of the belts on the surfaces of the pulleys. A belt is a band made from material with great tensile strength, and at the same time considerable pliability. It is found in practice that these requirements are best supplied by leather, or woven cotton, waterproofed and fastened together in layers with india rubber, gutta percha or Balata. For long drives rope belts and V-shaped pulleys are commonly used. The following tables give the horse powers which single and double leather belting of various widths can safely be set to transmit at differing speeds.

Table showing actual horse power transmitted by belting under average working conditions.

Velocity of Belt Feet per Min.	Width of Single Belt in Inches.									
	1	2	3	4	5	6	7	8	9	10
500	·4	1·0	1·8	2·7	3·7	4·8	5·9	7·1	8·2	9·5
1000	·9	2·1	3·6	5·5	7·4	9·5	11·5	14·0	16·5	19·0
1500	1·3	3·0	5·3	8·0	11·0	14·0	17·5	21·0	24·0	28·0
2000	1·7	4·0	6·9	10·5	14·5	18·5	23·0	27·0	31·5	36·5
2500	2·1	4·8	8·4	12·5	17·5	22·5	27·5	33·0	38·5	44·0
3000	2·3	5·7	9·8	15·0	20·5	26·0	32·0	38·0	44·5	51·0
4000	2·8	6·8	11·5	18·0	24·5	31·0	39·0	46·5	54·0	62·0
5000	3·0	7·5	13·0	19·5	26·5	34·0	42·5	50·0	59·0	68·0

Width of heavy double belt in inches.

Velocity of Belt Feet per Min.	Width of Heavy Double Belt in Inches.								
	2	4	6	8	10	12	16	20	24
500	2·4	4·8	7·2	9·6	12·0	14·5	19·0	24·0	28·5
1000	4·8	9·5	14·0	19·0	23·5	28·5	38·0	47·5	57·0
1500	7·0	14·0	21·0	28·0	35·0	42·0	56·0	70·0	84·0
2000	9·2	18·5	27·5	36·5	46·0	55·0	73·0	92·0	110·0
2500	11·0	22·5	35·5	44·5	56·0	67·0	89·0	110·0	135·0
3000	13·0	26·0	38·5	52·0	64·0	77·0	105·0	130·0	155·0
4000	15·5	31·0	47·0	62·0	78·0	94·0	125·0	155·0	190·0
5000	17·0	34·0	51·0	68·0	85·0	100·0	135 0	170·0	205·0

Bicarbonate of Soda.—Used in the food trades chiefly for baking purposes, is formed by exposing crystals of washing soda to a current of carbonic acid gas. Washing soda crystals consist of the carbonate of soda united with about its own weight of water of crystallisation. When exposed to the gas a further quantity of carbonic acid is absorbed, equal to that contained in the carbonate of soda, and most of the water disappears. The result is a white, opaque substance with a milder taste than carbonate of soda and much less soluble in water. This substance when powdered is the bicarbonate of soda of commerce. Its value for baking purposes is due to the large amount of carbonic acid it contains, which is readily given off as gas when the bicarbonate is brought into contact with acids, such as tartaric or hydrochloric. When the bicarbonate and acid are mixed with flour and water, the evolved gas is imprisoned in the dough, a paste formed, and "raises" it or renders it spongy in baking. In the case of the former acid tartrate of soda is left in the paste, and in the latter common salt, both of which are harmless in moderate quantities. Occasionally phosphoric acid is used to liberate the gas with the idea of introducing a bone-forming compound. Baking powders contain the bicarbonate and acid ready mixed with a certain amount of neutral substance to prevent premature evolution of gas. The best baking powder is the old-fashioned one consisting of

8 parts powdered tartaric acid,
9 „ bicarbonate of soda,
10 „ rice flour,

each ingredient to be well dried before mixing and sieving, and the mixture to be kept in a close tin.

Bicarbonate of soda is now made direct from a solution of common salt by passing into it ammonia and carbonic acid gases. The bicarbonate separates out as a crystalline powder, and chloride of ammonium (sal-ammoniac) remains in solution.

Biscuit Meal.—A meal ground from specially prepared biscuits and used in the same manner as sausage meal. It is a common practice to grind up all returned broken and other unsaleable biscuits with the oddments of the biscuit works, but as these usually contain sweets and many kinds of flavouring matters they are unsuitable for sausage making. Users should insist on having their biscuit meal ground from unsweetened biscuits, specially manufactured free from alum and all other objectionable fermentable ingredients.

Bismarck Brown.—Is a dye used for mixing with other colours for colouring the skins of luncheon or other sausages. There is no rule as to the quantity used.

Bisulphite of Lime.—Bisulphite is the best and most harmless preservative which has yet been discovered for butcher meat. It is made by distilling a mixture of strong sulphuric acid and sulphur together in an iron still. Sulphurous acid gas is evolved, and after purification is conducted into water containing quicklime, where it is absorbed by the aid of frequent agitation. After settling, the clear solution is run off into casks for the market. The strength of the solution should be from 12° to 15° on the Twaddell hydrometer. For use it is diluted with two or three volumes of water, and is then sponged or painted on to the meat which is to be cleaned or preserved.

For washing bacon a solution of bisulphite of lime, one to three parts of water, is sometimes used. After the sides are taken out of the curing cellars they are washed, and before being baled are dipped in the solution referred to. Slime and sourness are thereby prevented, more especially if the meat is being sent a long journey—say, from Ireland or Denmark to London.

Black Pepper.—see Pepper.

Black Pudding Dye.—A prepared artificial dye for blackening the outside of skins of black puddings when they are being cooked, and is used in place of logwood dyes at one time so common for this purpose. Black pudding dye has a great deal to recommend it in the way of simplicity, as the powder only requires to be added to the water in boiling pan in the proportion of half an ounce to every 20 gallons of water.

Black Pudding Machine.—see Brawn Meat Cutter.

Black Puddings (English)—No. 1.*

10 lbs. Midlothian groats (to be first boiled before mixing),
10 ,, leaf lard or back fat,
$1\frac{1}{2}$ oz. black pudding (herb) spice,
$1\frac{1}{2}$,, black pepper,
1 gallon blood (bullocks' or pigs').

A handful of chopped onions is sometimes added.

Method of preparation.—Boil the groats for about forty minutes previous to using. Cut the leaf lard into pieces $\frac{1}{2}$ inch square with fat-cutter. When the blood is being drawn from the bullock or pig, it should be stirred gently, and a wine-glassful of warm water added to every gallon along with 2 oz. of salt and 2 oz. food preservative. Mix all the ingredients well together, placing them in a black pudding filler, and fill into narrow bullock runners. Tie pieces about 18 inches long into lengths and bend them into circles, joining both ends. Boil at a very gentle temperature (180° Fahr.) for about twenty minutes, and then withdraw from the pot or boiler and allow to cool.

During the process of boiling add to the water either 1 oz. to every 10 gallons of black pudding dye or $\frac{1}{2}$ lb. of logwood chips, in order to dye them perfectly black. The old-fashioned way to tie black puddings is by means of dried rushes or bass strings, allowing the ends of the rushes to project about 3 inches.

Black Puddings (English)—No. 2.—Prepare 1 gallon (10 lbs.) of finest Scotch groats by boiling for about forty minutes in a loose sack, leaving room for them to swell out; also prepare some finest leaf lard by cutting it into square pieces about $\frac{1}{2}$ inch or $\frac{3}{8}$ inch square with fat cutting machine.

Make up from following:—

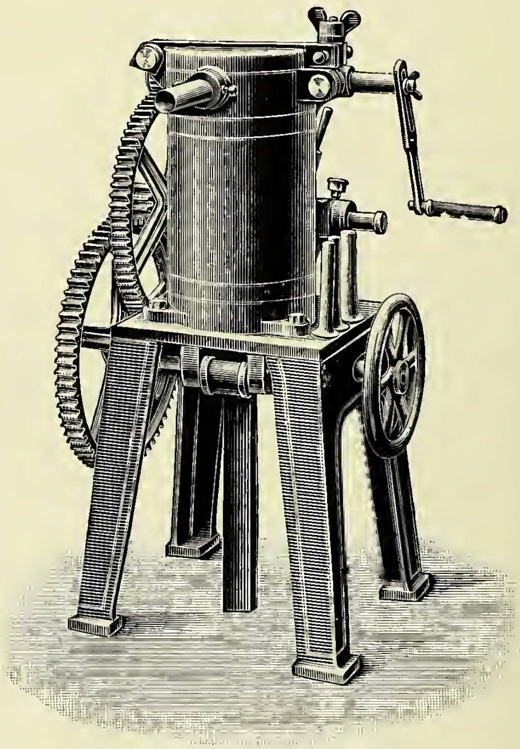
10 lbs. Scotch groats,
10 ,, leaf lard (cut in squares),
3 gallons blood (fresh),
15 oz. seasoning,
1 teaspoonful rubbed pennyroyal,

Add three or four chopped onions, if that flavour is desired.

Seasoning (make from following recipé):—6 lbs. salt, 5 lbs. Douglas's black pudding spice (herb), 5 lbs. black pepper, 1 lb. pimento, 1 lb. coriander seed. Add to this some carraway seed, if that flavour is desired. (The proportion of the seasoning used is 5 oz. to the gallon of mixture.)

Method of preparation.—Mix the blood and other ingredients, then place them in vertical filling machine, fill the mixture into black pudding skins ("bullock runners"), seeing that the pieces of fat are equally distributed throughout. Tie into pieces, forming a circle 6 inches in diameter, and tie in circles. Boil gently at about 180° Fahr. for about half-an-hour. Add to the water in the proportion of 1 oz. to every 20 gallons black pudding dye powder. Or put into water, previous to boiling, 1 lb. of logwood (finely ground) to every 15 gallons, and add a little powdered alum. When cooked, take out of the copper and tie with rushes with long ends at the joints. Before exposing for sale, rub them with a cloth on which has been dropped some salad oil.

The filling machine most suitable for black pudding making is of the vertical type. The funnel to which the



Black Pudding Filling Machine.

sausage casings are attached is near the top, and the approach to the funnel inside the filler is grooved in such a way as to prevent resistance or choking. The lid or cover is fixed on the top by a hinge, and is raised or lowered with great ease and rapidity. The thumb screw shown in drawing is simply unscrewed, and then the lid is free to be raised. The thumb screw also is attached by a pin to the side of the filler, so that there is no possibility of laying it aside. The plunger or piston acts vertically, and is raised slowly as required by turning the handle. When it is desired to lower it, the handle is pushed forward after raising a catch upon its shaft, and thus the machine is instantly thrown out of gear. To prevent the piston falling too rapidly, however, as it would do if not controlled, there is a regulating wheel which is attached to the piston rod and controls its fall if caught by the hand. The raising and lowering is carried out with great rapidity. When the mixture is put into the black pudding filler, the lid is closed with the thumb screw, and bullock runners or other convenient casings are attached to the funnel and the work of filling commenced. The end of the runner or casing should first of all be tied so as to prevent any loss, and the whole length of runner or casing on the funnel is then rapidly filled and tied also at the latter end. The lengths are then tied into lengths of 18 inches (or any other convenient length) in two places so that they can be cut off without any loss, and these lengths are in turn tied in circles, the two cut ends being tied together.

*Note.—In these recipés groats are given as the farinaceous stuff to be added. Some makers, however, substitute pearl barley or whole rice for them. This must therefore be left to the individual taste of the maker.

Black Puddings (Royal).—The humble black pudding is not supposed to circulate extensively among the "upper ten," yet, prepared in a refined way it is not unknown on the table of Royalty. This is how Francatelli prepares black puddings, and he was successively *chef* to the Earl of Chesterfield, Lord Kinnaird, Sir W. Massey Stanley, Bart., and Her late Majesty the Queen. We commend his recipés to those of our sausage-making friends who wish to go in for something *rècherchee*.

Black Puddings (French).—To one pint of pig's blood add rather more than half a pint of boiled double cream, three-quarters of a lb of the fat from the inside of a pig cut into rather small pieces, and four large onions chopped and fried in a little butter without becoming coloured; season with a little chopped bay leaf and thyme, nutmeg, pepper, and salt. Mix well together, and stuff the skins prepared perfectly clean for the purpose of the above, taking care to allow room for tying them into lengths of about six inches. Some water must be kept nearly at the boiling point and then removed from the fire down to the side and the puddings immersed, and allowed to remain in it until they become somewhat firm to the touch. They must not, however, be kept in the water longer than will suffice to set the preparation. The puddings, when taken out of the water, should be hung up in the larder to cool.

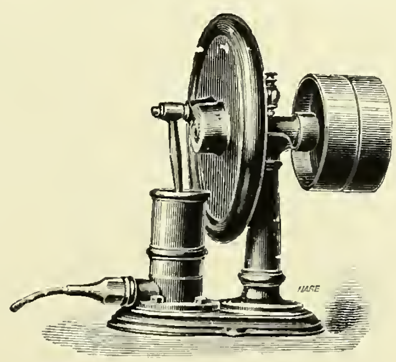
Black Pudding Making.

Black Puddings (English).—The chief difference from the foregoing in making black puddings, according to the English method, lies in the omission of the nutmeg, bay leaf, and thyme, and in the addition of boiled emden grits, or rice. In all other respects the same directions must be followed.

When about to dress the black puddings, they should be scored all over to prevent them from bursting while being broiled, and when done are to be dished up with stripes of dry toast placed between each piece of pudding. The centre of the dish should be filled with mashed potatoes to keep them quite hot.

As black puddings are liable to become slimy or mouldy if kept for a few days, it is desirable that measures should be taken to prevent these objectionable features. This can be done by dipping the puddings in a weak solution of dry antiseptic. This solution should contain half a pound of dry antiseptic to one gallon of water and should be boiled when prepared. Use the solution warm, and heat it every time it is used to about 120° F. When the puddings are cold and dry, they should be wiped and rubbed with a cloth which has been partially soaked in salad oil.

Bladder Blowing Machine.—A useful little machine constructed as a simple direct acting pump, to the cylinder of which is attached an elongated small nozzle. This nozzle is inserted into the necks of the bladders after they have been cleaned and they are then dilated, in which state they are kept till quite dry. This machine is an improvement on the method of blowing the bladders by the mouth, in-as-much as it prevents the dissemination of disease through foul breath being blown into the skins.



Bladder Blowing Machine.

Bladdered Ham.—see Hams.

Bladders. — Strip the necks and trim the bladders. Blow them and dry them well. Take them down and put them in soft water (rain water). Let them soak for three days, but change the water every day and squeeze them well. Dry each time before putting them into fresh water. On fourth day turn them inside out and put them into salt water for one day and one night, and then if not wanted put them in dry salt to keep them. Be sure to have salt clean. A little longer in salt water would not hurt. One and-a-half buckets water to one bucket salt.

Blade Bone Catcher.—A ready method of withdrawing the blade bone from a side of bacon is furnished in the blade bone catcher. The principle of its construction requires no explanation as it is so obvious from the illustration.

Blade Bone Catcher.

The Blade Bone Chisel generally

Blade Bone Chisel.

accompanies the blade bone catcher. Its flat face is used for removing any meat which adheres to the blade bone whilst it is being pulled out.

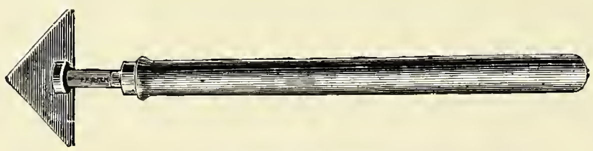
Blade Bone Chisel.—see Blade Bone Catcher.

Blocking Frame for Lard.—see Lard Blocking Frame.

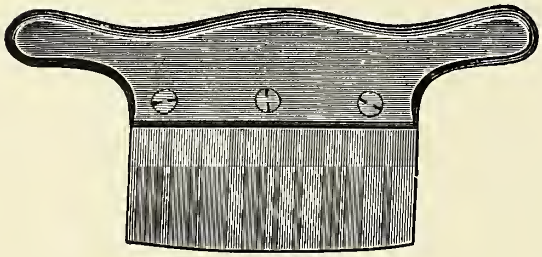
Blocks.—see Hornbeam and Maple Blocks.

Blocks and Pulleys.—see Pulley Blocks.

Block Scrapers.—These are used for scraping the surface of French hornbeam, American maple, or ash blocks, and are of various styles. The most popular patterns are illustrated below.



Triangular Scraper.



Double Handled Scraper.

Single Handled Scraper.

Block Sausage—(German Recipé).—For each block of 25 lbs. take

15 lbs. streaked bacon,
10 ,, lean beef (removing the sinews).

First mince the beef fine, then add the pork, and mince till the latter is the size of beech-nuts Then add spices—1 lb. coarse salt, $1\frac{1}{4}$ oz. white pepper, 1 oz. ground Indian cane-sugar, $\frac{1}{2}$ oz. pulverised saltpetre, one small stick of garlic, finely grated, $\frac{1}{3}$ oz. cardamom, two tablespoonfuls rum. The mincing-knife, as in the preparation of Cervelat sausage, must be often cleaned, and the meat must be well mixed and mixed until it has an appearance like marble. The meat is not to be kneaded, but thrown deftly from hand to hand. Put the meat into good clean salted oxen skins, 12 inches in length, being careful to stuff them tight and to let no air in through the filler. After they are filled, let them hang up for several hours, then either lay them in a good pickle for some hours, or rub them well with fine salt and lay them in a bowl and leave them in the cellar for twelve hours. Then wash them carefully in cold water, and dry. Now hang them in an airy place of a temperature from 50° to 55° Fahr., and let them hang until the sausage begins to show itself red under the skin. Then smoke them in a cold smoke of beech and oak sawdust mixed with a few juniper berries.

The meat for this sausage should be taken from a well-grown animal, like the Cervelat sausage. Cleanliness is most necessary, as in the Cervelat sausage, and care must be taken that the skins are dry and clean.

Blodföd.—Made in the Danish Svineslagteries.

$1\frac{1}{2}$ part molasses.
1 ,, blood.

After mixing, it is dried and pressed into cakes for cattle feeding. It is recognised as a splendid fattening material.

Blood (dried).—see Dried Blood.

Blood Sausage—(American Recipé).—Use cheek meat, heart, lungs, and pork rinds in any quantity that is convenient. Cut the pork rinds into small pieces, boil in clean water until three-fourths cooked, saving the broth and the rinds. Cut the balance of the meat together quite fine, and boil it slowly with the pork rinds and broth, allowing the broth to cover the meat. Remove the fat that rises to the surface, as the sausage will not look well if it is left. Cook until it is well done. Take one gallon of calves' or pigs' fresh blood immediately after killing. Stir it in a vessel 10 to 15 minutes until it will retain its fluid condition. Then pass through a fine sieve to break up any lumps. Mix 15 lbs. of the cooked meat as above with the one gallon of blood, and season to suit. Pour through a funnel into beef middle casings, filling three-fourths full, the end being tied. Cut into convenient lengths for sale. Tie up the open end, and place the sausage in the broth and allow it to boil. The blood, in cooking, will expand and fill out the remaining part of the casing. Stir continually, or the blood will all collect in the lower side of the casing. When cooked, the sausage will rise to the top of the water and float, owing to the expansion of the air. Wherever air collects, pierce with a small fork or fat will fill these places. When of a good appearance, remove and wash in clean cold water and allow it to remain there until cold. The sausage can be improved by smoking cold over a low fire of shavings or sawdust. A hot fire will cause it to sweat, and spoil its appearance

Blood Sausage—(North Germany).—Boil fat pork till not quite cooked and cut into small squares with cutting machine. To every 10 lbs., boil about 2 lbs. (well dried) selected rinds, and a calf's or pig's lungs, or instead of that a corresponding quantity of pork trimmings. When these are boiled tender, put the rinds and lungs or trimmings through the mincing machine (sausage cutting machine), scald the pork dice, and add enough well beaten pig's blood to make the whole moderately liquid, and then get the exact weight. (Reckon about 12 lbs. to the gallon). To every gallon add—

6 oz. salt.
1 ,, white pepper.
$\frac{1}{4}$,, cloves.
$\frac{1}{4}$,, marjoram.

Stir all well together and fill into casings ("bullocks' runners") with Douglas's vertical filler. Boil one to two hours

until no blood oozes out on the sausages being pricked. On coming out of the pan, wash in warm water, and lay on a table to cool, and afterwards smoke for a few days in cold smoke, if such a flavour is desired. (To every 10 lbs. sausage meat, reckon about 1½ lbs. of blood.

Blood Sausage—(French).—Take 1 lb. belly of pork, boil it with the same quantity of pork fat till tender, then cut the fat into small dice with fat cutting machine, and the lean meat into small pieces—not fine. Meanwhile have some onions, leeks, and eschalots steamed soft, added to the above meat. The pork is not scalded. To every 10 lbs. of this sausage meat add—

2	lbs.	pig's blood.
5	ozs.	salt.
½	,,	white pepper.
1/10	,,	thyme.
1/10	,,	mace.

Stir all well together and fill in narrow hog-casings (loosely), with Douglas's vertical filling machine, so making round narrow sausages. Boil till no more blood oozes out on being pricked with a needle. On taking out of pan, wash in warm water, and let them cool on a table.

See also "Red Sausage" and "Lung Blood Sausage."

Boar's Head—(Glazed).—Select for this dish a perfect head with good ears—the head must be cut off full—(*i.e.*) with two or three joints of the neck bone left on; all bone must be carefully extracted, care being taken not to cut the outer veins. The head is now well washed in cold water to remove all blood, and put into spiced pickle for six days, after which it is again well washed and stuffed tightly with "pork sausage meat," a piece of selected rind being stitched on back of head to keep in the stuffing. The head is then placed on a thin board and another piece placed alongside each cheek and tied in position to keep head in shape. The whole is now tied up in a cloth, and cooked gently, so as not to break the ears, but long enough to cook thoroughly. Allow to cool, taking care to place in position, so that it cools to a good shape, with ears erect When cool insert glass eyes, and, if available, a pair of tusks, then glaze.—see Glazing Recipé for Hams, Tongues, etc.

Boar's Head with Pistachios.—The procedure for making above is as for making brawn, but in this preparation the head and tongue must be chopped as nearly as possible in clean cut squares of say half inch square. Season with blanched pistachios and add one ounce to each 2 lbs. of chopped mixture.

Blower for Calves.—see Calf Blower.

Boar's Head (filled).—see Filled Boar's Head.

Boiled Beef Stand.—see Beef Stand.

Boilers.—see Steam Boilers.

Boiling Beef Sausage.—

Lean beef	25 lbs.
Suet and beef fat	5 ,,
Bread soaked and pressed	6 ,,
Salt	12 ozs.
White pepper	4 ,,
Ground nutmeg	½ ,,

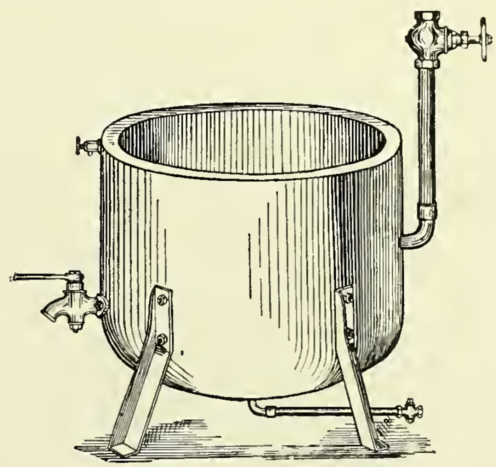
A wine glassful of bi-sulphite of lime.

Instead of soaked bread, sausage meal may be used.

The lean beef is first half chopped then the beef fat and suet added with the other ingredients and all chopped fine. It is then filled into weasands and tied into sausages of 1 lb. each.

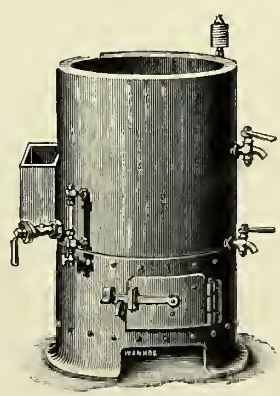
Boiling Hams.—see Hams.

Boiling Pans.—A boiling pan of some sort is a necessity to a sausage or provision manufacturer. It is therefore not so much a question whether or not a pan should be used, but rather what kind of pan shall be used. Where steam is available, a steam jacketed pan is the most economical and most effective.



Welded Steam Jacketed Pan.

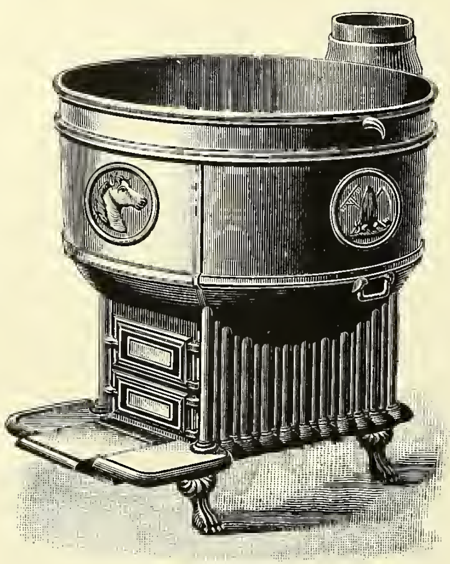
The welded pans are the best, because the absence of rivets not only prevents dirt accumulating, but the welding makes the pans more rigid and therefore more enduring.



Independent Jacketed Pan.

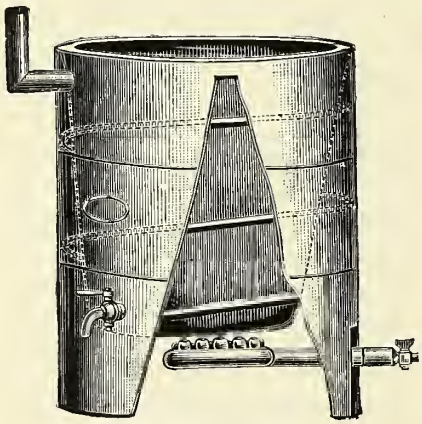
Where steam is not available, an independent jacketed pan may be used. It cannot be too strongly fixed in one's mind that for some goods, steam cooking is the only safe method, as the temperature cannot be so well regulated with an ordinary direct firing pan. Where goods are produced that are not liable to be damaged by overheating, then the common portable boiler may be used.

The inside pans of portable boilers may be had plain, galvanised, or porcelain enamelled according to the fancy of the user.



Portable Boiler.

Still another simple arrangement may be had in the shape of a gas heated copper or pan.



Gas Heated Copper.

These coppers are designed to economise heat by compelling the heat to travel round the plan in a spiral fashion as indicated by the dotted lines in illustration, and thus most of it is utilized before it reaches the outlet flue. The inside pan is made of copper and tinned, so that the heat acts very quickly.

Bologna Sausage—(American Recipé No. 1).—Use lean fresh meat—trimmings and cheek meat. Hearts can be added if they do not exceed a quarter of the whole bulk. Chop together very fine. While chopping add spices and seasoning, and from 25 to 30 ounces of salt to every 100 lbs. of meat. To every 100 lbs. of beef add 5 lbs. of pure fat, either fresh or salted pork. When the beef is nearly chopped add from 1 to 1½ lbs. of the best farina (potato flour) and sufficient water to suit. Mix thoroughly. Stuff into beef rounds, middles, or bungs. Tie the ends together into rings 24 inches long. Smoke with hickory wood and hickory sawdust if possible, as that gives a better colour and flavour. Remove when well coloured. Cook in boiling water. When the bologna is sufficiently cooked it will rise to the top. Pepper and coriander are the spices used for bolognas.

Bologna Sausage—(American Recipé No. 2).—Use equal parts of fresh beef and fresh pork. Add to this one-tenth of the amount of bacon. Chop together finely, adding seasonings to suit. To every 3 lbs. of meat use 1 oz. of salt. In adding potato flour, use 2 ozs. to 1 lb. of meat; and instead of using water, take the broth used in cooking beef bologna or in cooking meats for bologna. Stuff into middles from ten to twelve inches long, and hang up to be smoked. Smoke from two to twelve hours, according to fire and taste. If properly made this bologna will keep for a fortnight in any ordinary weather. To every 100 lbs. of meat use seasoning composed of 16 ounces finest white pepper, and 2 ounces ground corianders.

Bologna Sausage—(American Recipé No. 3).

Beef	70 lbs.
Fat pork	40 lbs.

chop together and add

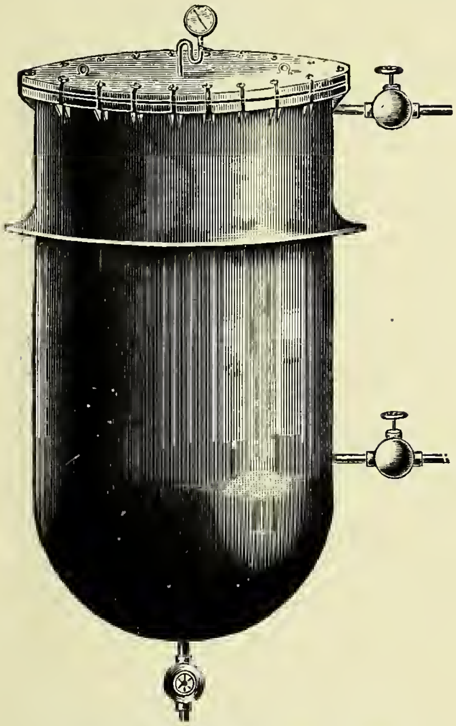
Salt	27½ oz.
Ground white pepper	7 oz.
Ground coriander	2 oz.

Stuff into beef rounds, smoke for 48 hours, and they will keep at any time of the year for at least two weeks. It requires only about ten minutes to cook them.

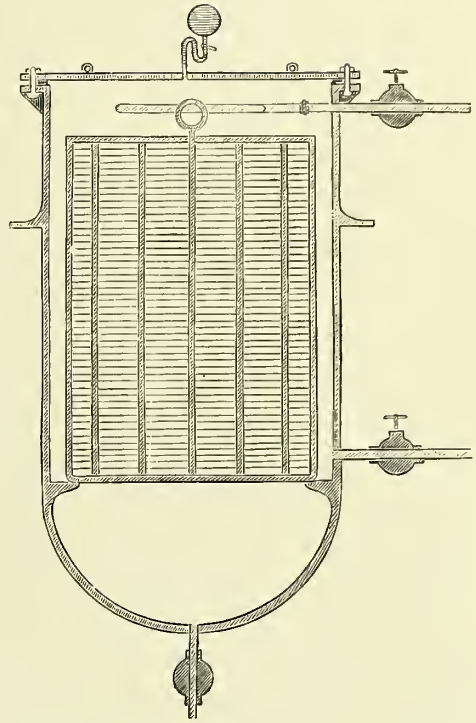
Bologna Sausage—(Italian).—Take 27 lbs. of fresh raw and lean pork, cut from the shoulder of the pig, 27 lbs. of cooked and pickled pig's neck, 27 lbs. of raw veal, cut from the leg, 5 lbs. of anchovy, all of which is to be finely chopped; then add 14 lbs. of raw fat pork cut into small cubes; season with 18 ounces salt, 11½ ounces ground white pepper, 4¼ ounces ground caper, 21 ounces pealed pistachio nuts cooked in wine. After carefully mixing the meat and spices, distribute amongst it six pickled and cooked tongues cut into slices. Then stuff into beef bung casings. Each sausage is entirely wrapped in a linen cloth and twine tied about this, after which they are cooked about one hour. Lay them out in a cool place for 24 hours. Either coloured or uncoloured fat may be poured over these sausages, when they may be further decorated with powdered sugar and small candies.

Bologna—(English).—see Polony Sausage and German Sausage.

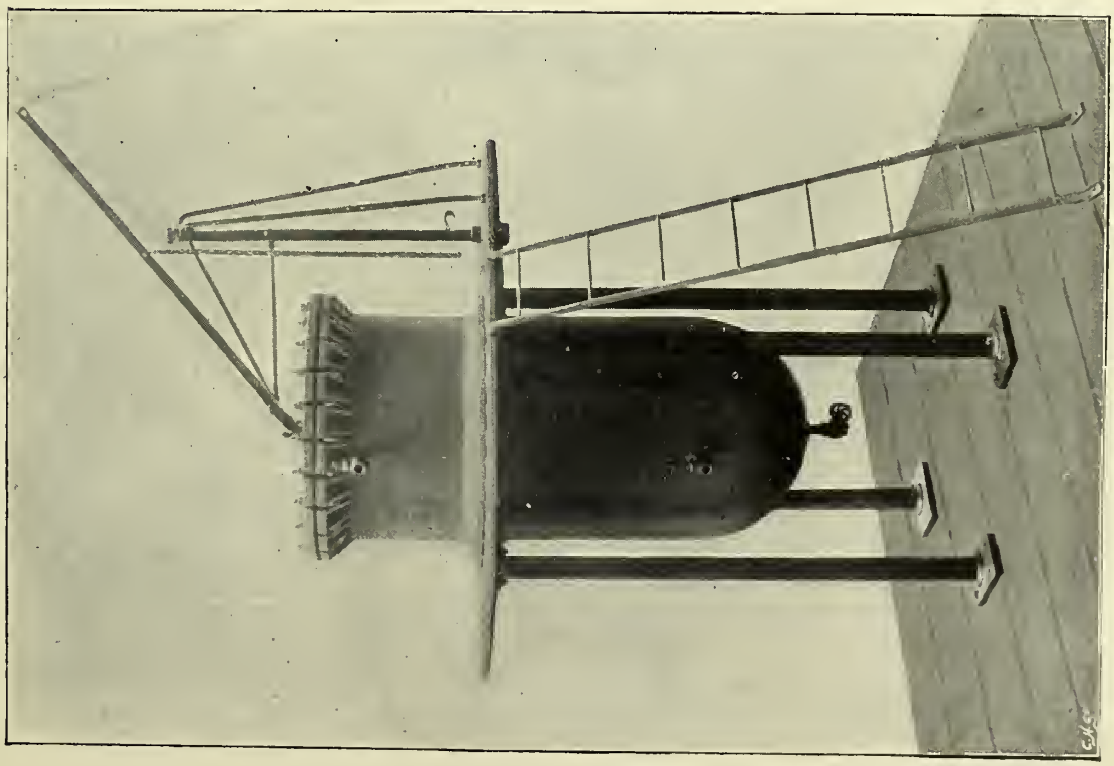
Bones.—*The best means to utilise them.*—In all meat and pork businesses bones prove to be a veritable drug. Not only are they an apparent loss but they are troublesome to handle. But it is impossible to conduct the businesses of meat purveyor, bacon curer, ham-cooker, or provision merchant, without having more or less of these commodities. It is therefore at all times desirable to consider the easiest and most profitable means of getting rid of them. The easiest way is to sell them to the bone boiler or knacker. It is also the least economical. Of late years this latter fact has



Outside View of Cylinder of Bone Digestor.



Cross Section of Bone Digestor, shewing how cage is fitted inside



Bone Digestor fitted up with Stand, Platform, Ladder, and Swivel Crane for moving lid.

Douglas Bone Digestors, Lard Pans, and Bone Grinder.

borne itself in upon many people and they have resorted to the use of appliances whereby bones and other bye products can be converted into money.

Now, these appliances are very simple, but at the same time they require understanding to work them. The first is the bone digestor. The bone digestor fulfils the conditions necessary in most of the businesses we have to deal with, in that it enables bones to be thoroughly digested under steam pressure without rendering itself a nuisance through bad smells. The design is of a cylinder with dished bottom and flat top, and the working position is the vertical one—the dished bottom being downwards The cylinder contains a false perforated bottom which is laid on a flange cast at the top of the dishing, and which is carried all round. On this false bottom is made to rest a cage, which is the same shape as the body of the digestor, but is a little less in diameter. Hence it lifts easily out and is lowered easily into position again. This cage has a hinged bottom upon it and this is meant to conveniently drop out the bones when they have been digested. On the top is a strong cover attached to the upper flange of the digestor, and this cover carries also a pressure gauge to indicate the steam pressure. Above the cage in the cross section is shewn a coil and it is fitted with a wheel valve outside of cylinder. This is meant for water and is used to wash the last vestige of grease off the bones when digestion is complete. Lower down is a steam inlet pipe with a wheel valve attached. At the very bottom and in the centre of the dished bottom is shewn another pipe and wheel valve. This is the outlet for water (condensed steam), fat and gelatine. The digestor as fitted up has a stand of four iron columns on a platform, and on this platform is a small hand swivel crane, which is used to raise the lid and swing it to one side, so as to enable the cage to be raised or lowered. The following is the official note relative to the complete apparatus:—

"Above shows a very complete and effective method of mounting bone digestor. The four iron columns carry a cast iron platform, which is very convenient for the workmen when taking off or re-placing lid, screwing up bolts, etc. The hoist shewn on platform lifts the lid, holds it suspended, and swings round to admit of the cage being taken out. The ladder is made of wrought iron. In connection with this there is also supplied an overhead rail with travelling monkey, from which is suspended a "Weston" block and tackle. With this apparatus the cage is lifted from the ground, swung along and lowered into digestor, or *vice versa*."

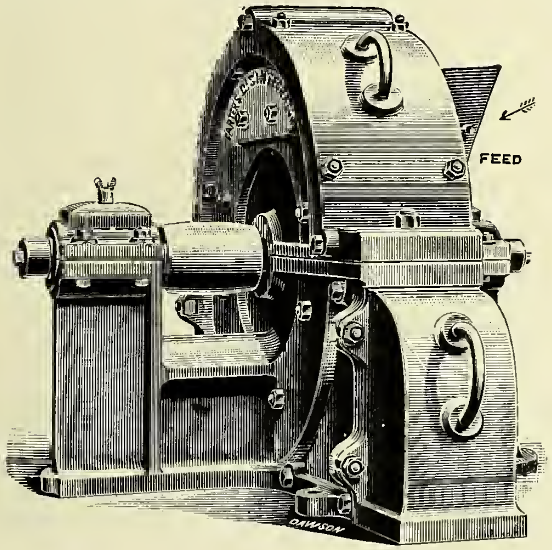
Without the overhead rail and travelling monkey, the digestor would not be complete. The mode of operation is as follows:—

The cage (which may hold from 1 cwt. to 10 cwt. according to size), is filled with fresh bones—the fresher the better—and is raised and lowered into the digestor. The cover is screwed down *tight* and the steam at from 35 to 40 lbs. pressure, per square inch, is at once turned on. For quarter of an hour nothing but condensation of steam takes place, owing to the large cool surface. The accumulated water must be run off. As the temperature of the cylinder gradually rises, the condensation becomes less, but it is easy to tell when the matter which collects in the dished bottom is water or otherwise, by turning the bottom outlet cock and examining what runs away. Presently the real digestion begins, and fat accumulates rapidly in the dished bottom. As it does so it is allowed to run off into dishes placed below outlet cock for the purpose. The process of digestion may continue a long time according to the kind of bones being treated, inasmuch as soft pigs' bones, for example, are much easier to digest than hard cattle bones. When the fat is all extracted, the liquor flowing through the outlet will become brown and slightly viscous; this indicates that the extraction of fat is complete and that the gelatine has begun to come away. The gelatine comes away for a considerable time until exhausted, and then the steam is turned off. The whole operation occupies about two hours, but with hard bones may occupy three. The quantity of fat given off is about twelve per cent. The quantity of fairly viscous gelatine given off is about ten per cent.

The cover is now screwed off the digestor and the cage taken out. The bones are dropped through the cage bottom either into a hand waggon, or are dropped directly on to an iron kiln under which there is a service of steam pipes. The bones are dried until quite crisp, and if it is proposed to dispose of them in the unground state, they are filled into bags ready for sale. If, however, they are to be converted into bone meal—and this is the most profitable thing to do—they are accumulated until there is sufficient for a day's grinding, then they are all ground together.

It is judicious to collect a quantity of bones for grinding, as in practice it has been found that very small bone grinding mills are not of much use, besides the product is never uniform, and in bone meal as in many other things, this is a desideratum.

The grinding mill is always of the centrifugal sort, and is termed a bone "disintegrator." In the centre is a heavy bushed spindle to which is attached a number of hardened



Centrifugal Bone Disintegrator.

steel arms. This spindle is revolved at a very high speed (2000 to 3000 revolutions per minute), and the arms revolve inside a cover which has flat sides and a corrugated top. The bones are fed by a hopper to near the centre of the machine, and are caught up by the swiftly revolving arms and dashed to pieces against the cover. The bottom is formed of movable screens, and through these the powdered bones fall into suitable receptacles. Often it may be advisable to have a mechanical revolving circular sieve, which will separate out the various sizes of bones and meal, but this is only of use when large quantities are handled.

The usual price for green bones is from two to three shillings per cwt. The price of bone meal is from five to six shillings per cwt. There is a large margin of profit.

Analyses of the bone meal produced are given below.

Analysis No. 1.

Phosphoric acid	20·85	Valuable Constituents.	
Lime, alkalies, etc.	27·59	= Phosphate of lime	45·52
Organic matter	44·57		
Moisture	6·80		
Sand and insoluble matter	·19		
	100·00		
Nitrogen	4·41	= Ammonia	5·35

Analysis No. 2.

Phosphoric acid	20·80	Valuable Constituents.	
Lime, alkalies, etc.	27·80	= Phosphate of Lime	45·38
Organic matter	44·24		
Moisture	7·00		
Sand and insoluble matter	·16		
	100·00		
Nitrogen	4·62	= Ammonia	5.60

The fat is worked up by washing in mudgeon vats, that is to say, large wooden vats three parts full of water. Into these the fat is put and is boiled up by means of a steam coil in the water. All the impurities are taken up by the water and the clear fat floats on the top. In many factories the ham fat and second fat is cut through a fat cutter, and is treated in the mudgeon vats in the same way. The object is to get clean fat which brings a higher price than rough fat.

The gelatine is first of all concentrated in pans, and is then run into shallow tinned iron saucers, which are placed in a long tunnel on racks. Through this tunnel is drawn warm air at a temperature of 90° to 95° Fahr., and it passes over these saucers, removing the excess of moisture gradually until the gelatine becomes caked in which condition it may be sold. Gelatine from bones, if they are sweet and fresh, is largely used for jellying pork pies and in making brawn. It is also used for making sweets (jujubes).

Boning Knife.—At one time any knife with a well worn blade was used for boning, but a special knife for the

Boning Knife.

purpose is now made. It will be seen from the illustration that it is made practically the same shape as the old fashioned worn knife.

Boracic Acid, now generally called boric acid, is a product found naturally in small quantities in several parts of the world. In Tuscany especially, certain hot geysers or lagoons yield a considerable amount of it, but this acid is dark in colour and contains a considerable amount of salts of ammonia and other impurities, which render the acid unfit for use in medicine or as a preservative. The pure white acid is now almost entirely produced from the native borates of lime found in North America and Asia Minor, and known respectively as "Colemanite" and "Boracite." Pure boric acid is found in commerce in thin pearly crystals or as a fine white powder. It has very little taste, is inodorous, and is given internally as a medicine in doses of fifteen grains. It dissolves in about twenty-six parts of cold water but is much more soluble in hot water. It has the property of destroying the germs which cause putrefaction in flesh, and on this account it is extensively used for dusting over wounds and in surgical work. It is employed largely in the form of boracic lint or cotton. Boracic acid is of inestimable value for this same reason as an antiseptic and food products preservative, since by its use in minute quantities the germs which cause meat, milk, and other products to "turn," or in other words to become sour, tainted or rancid, are destroyed, and it is therefore possible to convey butter, meat, hams, bacon, etc., from very distant places to market in a perfectly sweet and fresh state. Formerly this was done by employing excessive quantities of salt or saltpetre, and in former times butter, meat, etc., so treated had to be soaked or washed in water before it could be eaten. The use of an excess of salt is particularly injurious to meat of all kinds, since it causes the juices to flow out, carrying with them large amounts of nutritious and valuable constituents with considerable loss in weight, and leaves the meat in a tough and leathery condition. The use of boric acid also destroys ptomaines, and considering the large number of cases of illness and death that have been noticed during the last few years from this cause, *i.e.*, the consumption of unprotected

food products, the remarks of the late distinguished physician Sir Benjemin Ward Richardson, may be noted. He said—"*I think one must remember that poisons are actually formed from foods* by their spontaneous decomposition, and that foods, which may be perfectly good and harmless at the time they were sold, might be allowed by the purchaser to remain lying in a warm place for such a time that spontaneous alterations might occur in them, and illness, or even death, might result from their consumption.

"Respecting the use of antiseptics in food, my opinion is that when used in *proper form* and quantity, they are perfectly correct—that is to say, they cause no injury whatever to the consumers."

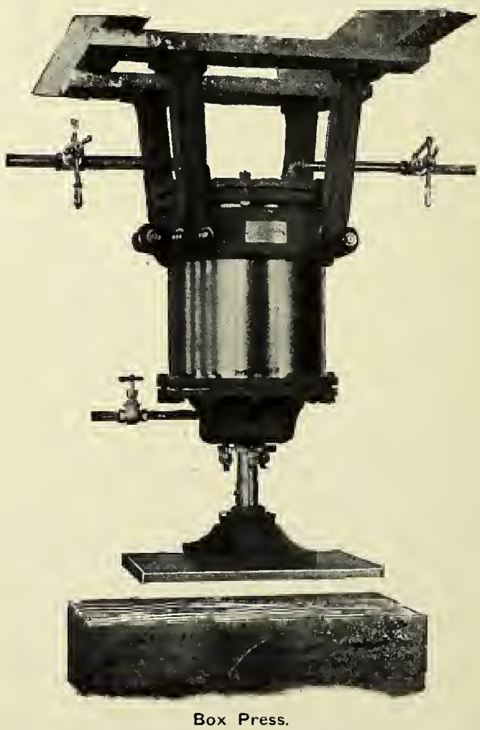
Boric acid is of great value for washing and keeping perfectly sweet all kinds of utensils, blocks, meat safes, etc., also for milk cans. It must be remembered that while boric acid products will prevent putrefactive decomposition, they have no power to cure tainted or soured articles.—see also "Borax."

Borax is a well known salt possessing a mild saline taste. Its chemical name is biborate of sodium and its formula (Na.$_2$o, 2b.$_2$ o$_3$ × 10aq.) Formerly it was obtained in a crude state from Thibet and India, but of late years it has been almost entirely made from the borates of lime and soda, which are found in great abundance in both North and South America and also in Asia Minor.

It has been employed for centuries in medicine, both for external and internal use in the form of lotions, gargles, and paints for the throat, and as an astringent sedative to inflamed surfaces. The well known "honey and borax" is commonly applied to newly born infants for the complaint known as thrush. Borax dissolves in about twenty-two parts of cold water, but one part of boiling water will dissolve two parts of it. A very large amount of borax is used in soldering and brazing metals, for pottery glazes and enamels, and for the manufacture of the enamelled iron and steel vessels which have of late years so largely replaced utensils of wood and tin. These enamelled pans, boilers, and tubs, are of great service to the meat and provision trades for cooking, pickling, and storing meat. The advantages which they offer when contrasted with wooden tubs, and the ease with which they can be cleaned are obvious. Borax possesses most valuable antiseptic properties which render it of inestimable value to meat packers, especially for pork, bacon, and hams, and also to butter manufacturers and sausage makers. Before the use of borax as a food antiseptic was known, it was necessary to treat flesh products which had to be kept with an excessive amount of salt, or of salt and saltpetre. This excess not only caused the meat to be unpalatable, but it gave rise, as is well known, to the terrible disease of scurvy, a proof that large amounts of common salt are capable of producing serious results when consumed. When it was discovered that a *small* amount of borax would effectually replace a *large* amount of salt or saltpetre, and also enable the meat or other articles to be sent to market with a much better appearance and flavour, it came largely into use. In fact, a large American importer states that he now imports, with the aid of borax, more bacon and ham in a week than he could formerly do in a year when he used common salt only. Every innovation and improvement of this kind has always at first to contend with a considerable amount of unreasoning prejudice, and since borax has been substituted for the excessive amount of common salt formerly employed, it has been alleged (without any real proof however) that its use in food products is injurious to the consumer. This question has been enquired into by a very large number of eminent medical men both in Europe and America, and also by commissions appointed by various governments in Russia, Germany, France, America, etc., with the result that it has been conclusively proved that borax has no injurious effects whatever to health, when employed in rational and not excessive amounts for the preservation of food. The recent and very exhaustive report of Dr C. Liebreich, Professor of Chemistry in the University of Berlin, on this point deserves especial notice. Borax is used with advantage in preserving butter, cream, eggs, sausages, etc. It has been found, however, that certain compounds prepared on a borax and boracic acid base, are far more effective and desirable as preservatives than the crude preparation, and users should apply for these only to reliable firms whose goods enjoy an established reputation.

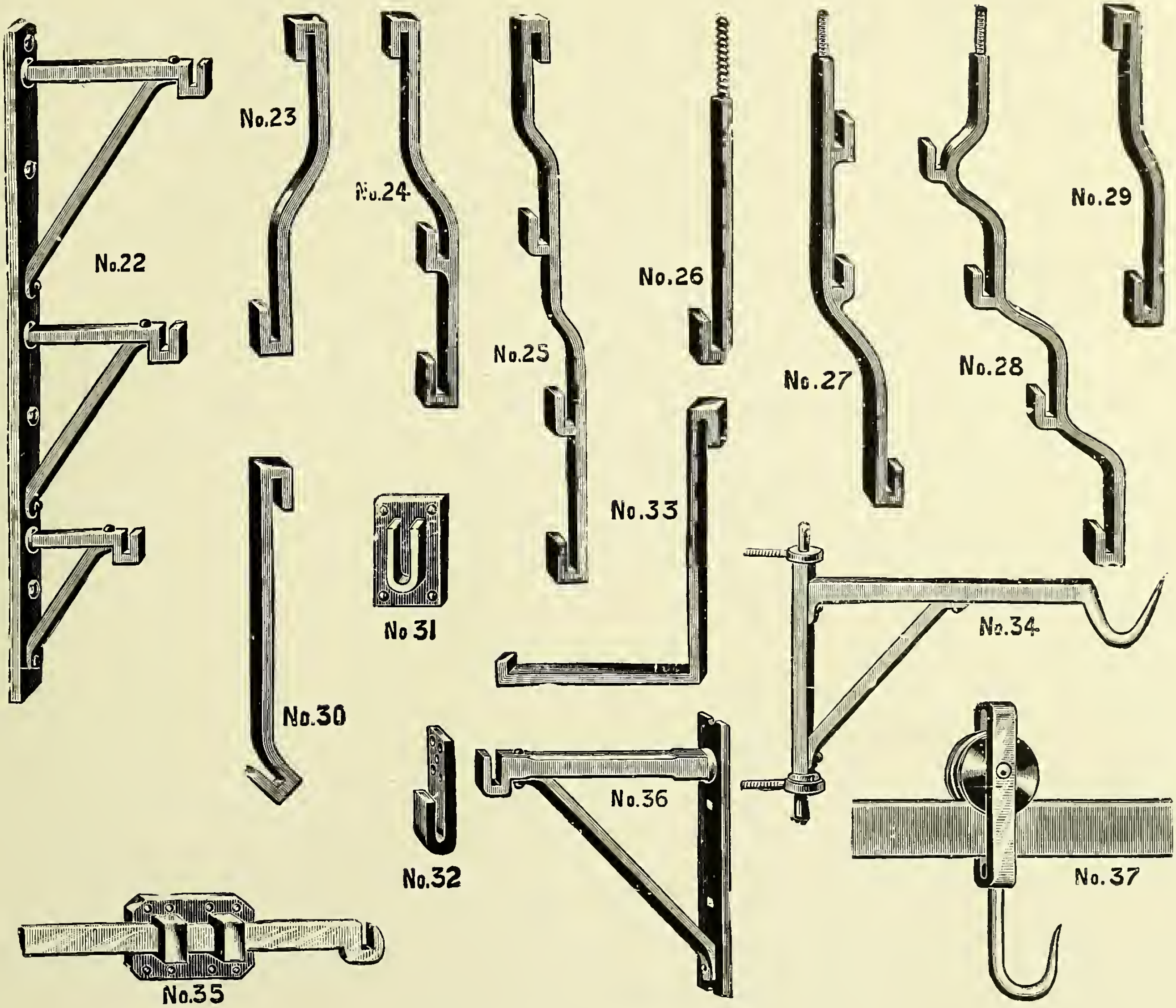
Bone Saw.—see Saws.

Box Press.—This is a steam apparatus almost universally used in the United States of America. It is used for packing meat in boxes. The meat is packed into the box by hand and stacked about a foot above the top of box, and the latter placed in position under the plunger. The plunger is then forced down by steam pressure until the meat is rammed down below the top of box. The pressure can be instantly released, and the covers adjusted, as the lift is practically instantaneous. It goes without saying, that the work done by this machine could not be properly done by hand, and the only rival it has is the screw press. It is, however, much superior to the latter in the saving of labour, although the screw machine has still its devotees.



Box Press.

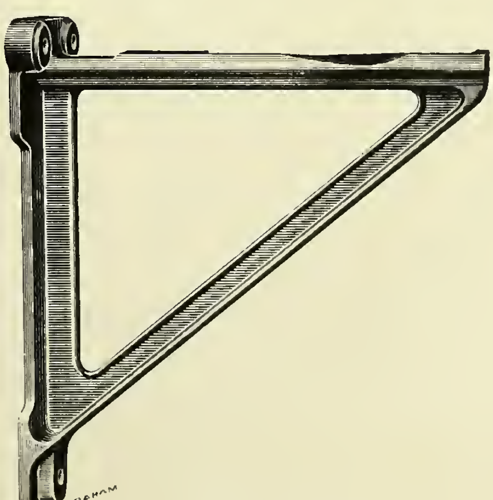
In many factories compressed air is used with the box press instead of steam.



Iron Brackets of Various Patterns.

Brackets—(Shop).—These are made in great variety for shops. They may either be polished or dark iron. In some cases they are electro plated. The various sizes and sections in general use are shewn above :—

Brackets—(Wall).—Supports on which shafting is carried along parallel to a wall; they may be in any form to suit special requirements, but the usual form is as illustrated. It will be observed that the upright portion of bracket is bolted to the wall, and the horizontal arm is prepared to carry a plummer block for holding the shafting. It depends entirely on the diameter of shafting as to the size of plummer block that is required.



Wall Bracket.

Brain Sausage—(American Recipé).—Take the brains of two calves, and after removing the skin, crush finely, mix with it $1\frac{1}{8}$ lbs. of lean and $1\frac{1}{8}$ lbs. of fat pork taken from a young pig. In chopping add four to six raw grated onions, $1\frac{1}{4}$ ounces of salt, and $\frac{1}{2}$ ounce of ground white pepper. Stuff into beef round casings. Cook for five minutes in clear water, and cool quickly in cold water. They should then be kept in a cool place. In preparing them for the table, they should be fried in butter for a short time, and can be eaten with any kind of vegetables.

Braised Beef.—Braised beef is made from the briskets of beef which after being boned are immersed in the following pickle:—

55 lbs. salt.
5 lbs. saltpetre.
5 lbs. cane sugar.
5 lbs. Douglas's antiseptic.

The above is made up to twenty gallons with water and stirred until the whole is dissolved. Should the solution not be quite clear, it will be necessary to boil it and skim until it is clear. Keep the meat in this solution of pickle for six or seven days, according to the degree of saltness required. Of course if the meat is wanted very mild, then a shorter period would do, say two to three days. Take the meat now after it has been cured, and boil until it is quite soft. Remove it from the boiler and place in a braised beef press. The cover of the press is screwed down on the top of the salt meat and the whole is allowed to cool; when cooled the meat is removed and covered over with glaze. When cold, the whole is nicely trimmed and placed on a cutting board, in which there are two spikes for keeping the meat in position.

Braised Beef Press.—see Beef Press.

Braised Beef Stand.—see Beef Stand.

Brake for Paste.—see Paste Rollers.

Brawn Canning Vat.—see Canning Vat

Brawn Cooling Rack —see Cooling Rack.

Brawn Making.—Clean fresh pig's heads well and bone them out. Commence with the cheeks first: take out the jaw bones, and then the tongues, and then the eye pieces. Get a small barrel and dust it with the following mixture:—

5 lbs. salt.
$\frac{1}{4}$ lb. saltpetre.
$\frac{1}{2}$ lb. dry antiseptic.

Rub the tongues, more especially at the roots. Put the tongues into the barrel first, then the cheeks, after dusting them over with the mixture, and lay them well over one another *rind to rind.* Use the small pieces to fill in between. Between the layers dust freely the mixture, so that each portion of meat receives a covering. Keep the meat in the barrel for from twenty-four to thirty hours, then put it into jacketed pan or boiling copper, with just sufficient clear water to cover the meat. Boil for an hour at 212° Fahr., then remove on to a fine sieve and strain out the jelly. Now cut the meat as nearly as possible into squares by means of a knife, or better, by means of the brawn cutting machine (see page 97). When this is done put your cut pieces into glass moulds or other suitable dishes, and fill up with the jelly previously strained off, and allow to cool. Some prefer to keep some tongues separate, and cut them into long pieces. These they stick down into the meat before the jelly is added. Some put in whole tongues. Seasoning for this brawn should be added when the meat is being boiled, and should be made on the following plan:—

For every twenty heads use—

3 ounces white pepper.
$\frac{1}{2}$ ounce cayenne.
A thimbleful of essence of lemon.

a few whole cloves and some pepper corns throughout, give a nice flavour.—see also Collared Head.

Brawn.—*An old fashioned recipé.*—Brawn is the flesh of a boar soused or pickled, for which end the boar should be old, because the older he is the brawn will be more horny. It is the flitches only, without the ham or shoulder, that are made use of for this purpose. Brawn is prepared in the following manner; after the boar is killed, the flesh is to be sliced off the back bone and ribs, and afterwards sprinkled with salt; it must then be laid in a tray till the blood be drained from it; give it a little more salt, and let it be rolled up as hard as possible.

The length of the collar of brawn should be as much as one side of the boar will bear, so that when rolled up it will be nine or ten inches in diameter. After being rolled up, it must be boiled in a copper till it is so tender that you can run a straw through it; then lay it aside till it is thoroughly cold, when it must be put into the following pickle:—to every gallon of water put a handful or two of salt, and the same quantity of wheat bran; boil them together, drain the brawn as clear as you can from the liquor, and when it is quite cold put the brawn into it.*

Brawn from Pig's Heads.—First clean pig's heads well, then bone out the heads fresh. Begin with the cheek first, take the jaw bone out, and then the tongue, and then the eye piece. Get a small barrel, dust the pig's cheeks as follows:—5 ounces salt, $\frac{1}{4}$ ounce saltpetre, $\frac{1}{2}$ lb. antiseptic powder; rub the tongue with it. Put some of this in the barrel first, and also rub the cheeks well with the mixture. Lay one on the top of the other rind to rind—the small pieces being laid on top well pressed down, and kept in barrel not less than twenty-four hours or thirty hours. Then put in jacketed pan or copper—the jacketed pan is the best; add clean water sufficient to cover the heads. On no account wash the heads after being taken out of barrel. Boil about one hour or little more, according to size of heads. If you boil longer you spoil your collar head and it won't keep.

Now with brawn: after the heads are done, cut the cheeks up in small pieces. If you should get short of liquor, add some from stock, which should always be at hand. Keep the cheeks as warm as you can.

* From a "Treatise on the Breeding of Swine," by Robert Henderson, 1814.

Potted Meat and Brawn Making: German Sausages hanging from the Ceiling.

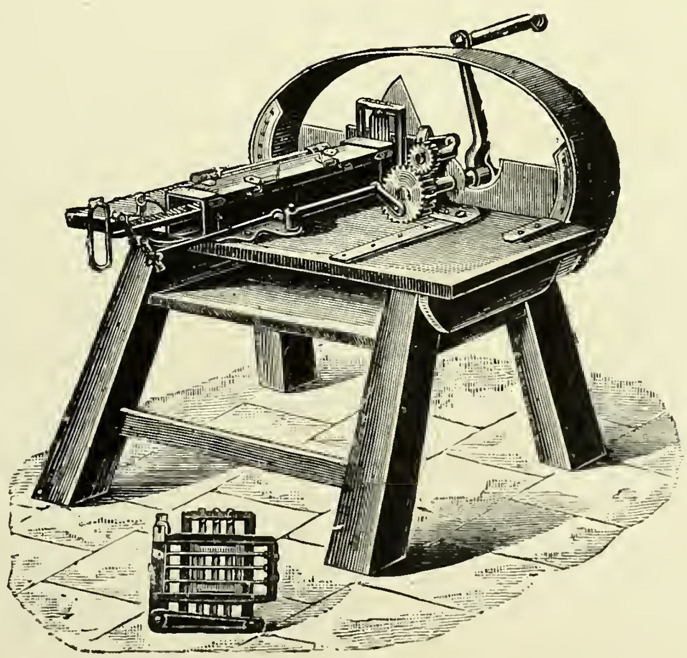
Now comes the principal work: when the cheeks come out of copper, boil your liquor up and skim your fat off till you find the jelly quite clear, then add the pieces you have cut up into copper. Best seasoning is—to twenty heads: 3 ounces white pepper, 1 ounce cayenne, a thimbleful of essence of lemon, and 4 ounces antiseptic Boil up for a little time and stir up. Take meat out again with a bowl with holes in, so that the jelly runs out into copper. Put the pieces in a large basket or tin, the former is the best. Skim again with steam off, then put the meat back again keeping it warm all the time. Stir well up again, and then put in tins or glass moulds. Be careful when filling the latter not to have the brawn or collared head too hot. After an hour fill the moulds with the jelly, and you will find you have the finest and clearest collared head.

In England you can use whole cloves which flavour it nicely. Use about two ounces with the above lot, put in usually when you put the heads in copper, but on no account boil the heads unless they are boned out.

Brawn Meat Cutter.—This machine is the most satisfactory brawn meat cutter made. It is also very suitable for cutting squares of fat for black puddings, German or luncheon sausages. The fat or brawn meat is put into the iron box on table of machine, and each turn of the handle moves the upright, lateral and cutting off knives, and also presses the meat forward ready for the succeeding revolution. Various sizes of squares can be cut with the machine by simply changing the knife case.

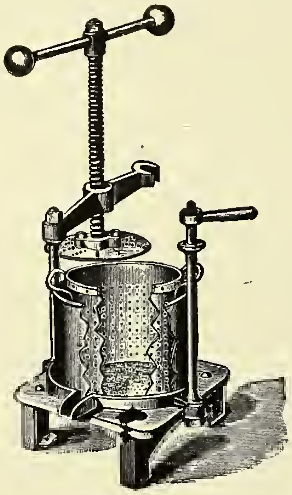
Bread.—Bread is used very extensively in the "pressed" state, and is usually prepared as follows: The bread selected is generally stale and hard by being kept, and the baker thus finds a ready outlet for his unsold loaves. The loaves are used entire if they are not blackened or too brown. If they are such, the objectionable crusts must be removed, as otherwise their presence will injure the colour of the sausages. They are broken into pieces and soaked in water for some hours, or may be left all night. (It is always desirable to add some food preservative, in the proportion of one ounce to one gallon of the water used for soaking, so as to counteract the liability to fermentation produced by the yeast used in baking). When properly soaked, the bread is put into a bread press and the whole of the water pressed out. Remove the bread from the press, break down into fragments with the hands, and it is ready for use.

Bread and Butter Sausage.—Take the sinews out of 22 lbs. of veal and $17\frac{1}{2}$ lbs. of rather lean pork, and chop fine. Season with $19\frac{1}{2}$ ozs. of salt, $1\frac{1}{2}$ ozs. of saltpetre, 3 ozs. ground pepper, $\frac{7}{8}$ oz. ground cloves, $\frac{1}{3}$ oz. ground ginger, and work together to a moderately stiff paste. Then cut $4\frac{1}{2}$ lbs. of raw bacon into small pieces; lay them for ten minutes in hot water, and afterwards let them drip and cool on a sieve; then work them into the paste, mixing all thoroughly. Fill into sheep or ox skins, pressing in very tightly. Hang the sausages up, and smoke them very fast. When red take down and boil slowly from twenty to thirty minutes. Lift out of the boiler and place on a table to cool.



Brawn Meat Cutter.

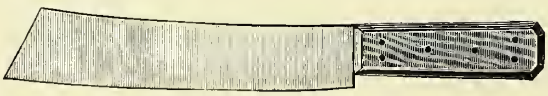
Bread Press — Where bread is used in sausage making a press is a desideratum. The bread is first thoroughly soaked in water, then put into the cullender and pressed as much as possible so as to remove alum or other ingredients which, if not removed, would cause souring in the sausage. The bread is left in a soft spongy condition, which enables it to assimilate easily with the meat, and absorb a large amount of fat.



Bread Press.

Breakfast Sausage — see German Sausage.

Breast Chopper.—Every one has their own ideas of what a chopper should be, but there can be no doubt as to the popular idea of a good breast chopper. The one illustrated, commends itself to the majority of users.



Breast Chopper.

Breeding of Pigs' Institutions (Denmark).—(By M. P. Blem).—The Ministry for Agriculture has now informed the various pig-breeding institutions, that they will grant a subsidy of Kr. 80 to the recognised pig-breeding institutions' boars, according to the rules laid down in the circular sent out to the Agricultural Association (Landboforeninger). Thus it is shown that all in all Kr. 4000 will be distributed in the year of finance, 1899-1900: Thus—

Roshilde	Amt.	5	institutions with	5	boars Kr.	400
Holbœck	,,	3	,,	3	,, ,,	240
Soró	,,	1	,,	1	,, ,,	80
Prœsto	,,	5	,,	8	,, ,,	640
Mariebo	,,	4	,,	4	,, ,,	320
Bornholm	,,	19	,,	21	,, ,,	1680
Svendborg	,,	5	,,	6	,, ,,	480
Vejle	,,	1	,,	1	,, ,,	80
Ribe	,,	1	,,	1	,, ,,	80
Altogether		44	institutions with	50	boars Kr.	4000

The following gives the numbers of breeding centres supported by government.

	Centres for Yorkshire Pigs.	Centres for Danish Breed Pigs.
Sjœlland	5	35
Jylland	4	38
Lolland-Falster	2	3
Bornholm	0	4
Fyun	2	5
Samsó	0	3
In all	13	88

Stiff Disease in Pigs in Denmark.—(By Vet. Hegeland Skovby.—Forty years ago one knew practically nothing about stiff disease in pigs. At that time the pigs were allowed to wander about freely, especially breeding pigs, and came of an old and hardy land race.

This now so much feared disease sprung up by degrees after the crossing with the more improved English breeds, and by the mode of the pigs living becoming less natural.

The stiff disease is especially prominent in the winter months from December to March, and especially in winters following on dry summers; the pigs are mostly liable to catch it at the age of two to six months, *i.e.*, at the age when the bone system is developing at its quickest. Of course it is only natural that one should use all known means to counteract this disease, which, whenever it breaks out, generally claims a large number of cases; and of these one of the principal is, that the pigs should have a *dry* and somewhat snug place of abode, to which light and fresh air have plentiful access. The bed must be dry and well strewn, but if straw or the like be not procurable, the floor should at least be made of boards.

Troughs and feeding utensils must always be clean and swilled out at least once a week thoroughly with lime water. The food must be reasonably mixed, not sour, and not thin or watery, preferably of the thickness of porridge. Too loose food, be it either water or milk that is used for diluting, is absolutely very bad since it weakens the digestion, and therefore gives the pigs less strength with which to combat the disease. If roots (mangolds, etc.) are added, the mixture is more general and will help to keep the digestion in good order.

The pigs must absolutely have some—preferably much—exercise in the fresh air, when the weather does not altogether prohibit it. It is also very necessary to give the pigs a chance to get hold of lime in an easily digestible form, such as mortar, lime gravel from broken down walls, or such like.

If the disease has once started before the above preventive measures are adopted, medicine consisting of cod liver oil and phosphorus must be administered with perhaps an easily digested iron salt; this medicine cannot be got at a chemist's, but any veterinary surgeon can make it up and give directions for its use.

If the pigs are treated as soon as the owner has discovered the nature of the disease, and at once brought under good hygienic conditions as well as given a suitable diet, a cure will be effected by the aid of the medicine in one or two weeks. The medicine, which is given immediately after the food, is very much liked by the pigs.

It has been a very great mistake of the owners, that they have only grappled with the disease in a too advanced stage, also that after administering the medicine not enough has been done to better the hygienic conditions of the pigstyes, also that the medicine was left off too soon, namely—as soon as the pigs showed an improvement. The cure for stiff disease, first used by Vet. Hutzen Vejle, gives very satisfactory results if used in good time and in the proper way, and has the advantage of being cheap.

Brine Preserving Powder. — A specially prepared highly strengthened antiseptic powder for preventing brines or pickles going sour. In summer it is a good plan to use it in all brines, as it saves a large amount of waste, and increased trouble in boiling and re-boiling the brines. The basis of this powder is the dry antiseptic, so commonly used for preserving all kinds of food. Brine preserving

powder should be used as follows:—Dissolve 1 lb. in a gallon of hot water, and add one pint of the solution to every $2\frac{1}{2}$ gallons of the brine.

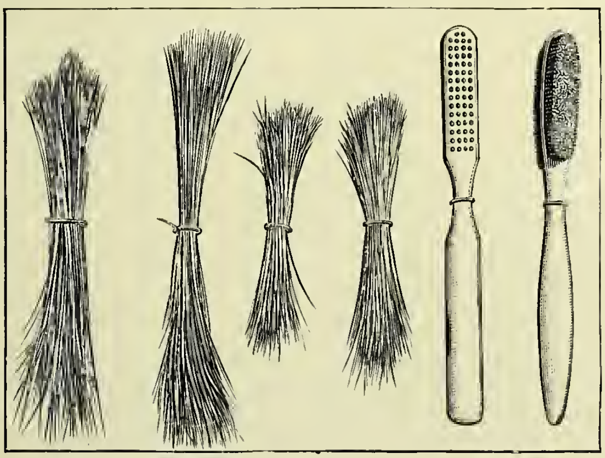
Brine Preserving Solution.—A solution of brine preserving powder slightly coloured and strained so as to remove any foreign matter or sediment. It is used at the rate of one pint to every two or three gallons of brine.

Brine Pump.—see Pickle Pumps.

Brisket Press.—see Beef Press.

Brisket Stand.—see Beef Stand.

Bristles.—In France and Russia a lucrative trade is carried on in collecting and assorting pigs' bristles for the English and other markets. The use these are put to in England is in the manufacture of brushes (principally tooth brushes). The bristle merchant collects his stock in small quantities from the various piggeries, and then puts them through a series of operations to make them fit for sale. These operations consist mostly in washing and assorting. The latter process is carried out by drawing the bristles through steel combs, then putting them into various lengths, etc., as the prices vary according to size and stiffness. The stiff Russian bristles come principally from St Petersburg, Poland, and Siberia, Germany also competes in the bristles market, as at Leipzig two fairs are held annually; the buyers are mostly London merchants who attend the fairs. Stocks are kept in London, from which the brush makers of the United Kingdom draw their supplies. It seems strange that the assorting of bristles in the United Kingdom has been so long neglected, as it stands to reason that if it pays to work the trade on the Continent, it should be equally remunerative in this country.



The Various Stages of Brush Making, from the Bristles to the Complete Brush.

Brunswick Cervelat Sausage (German Recipé).—To make Brunswick Cervelat Sausage, the procedure is as follows:—

For every "block" of 50 lbs. take

28 lbs. lean pork.
10 ,, beef (weighed after the sinews, etc, have been cleaned out)
12 ,, bacon fat, cut into fine shreds.

Spices—

2 lbs. finely ground salt.
3 oz. coarsely ground white pepper (free from dust).
1 ,, cleaned and pulverised saltpetre.
$2\frac{1}{2}$,, pure cane sugar.

First, mince the beef very fine, then add the pork, and mince the two together until the pork is all in pieces the size of peas, then add the pork fat, which must be mixed until it shows amongst the rest in pieces the size of lentils. Then add the spices and salt which should first be thoroughly mixed together, afterwards mincing the whole well together, being careful to clean the mincing knives well the while, as the spices are apt to cling to them. This time the mixture must be minced until the pork shows through the rest the size of pin heads. This can be done best by the use of the Alexander meat cutter with the smallest size square-holed plate. Fit a proper sized nozzle on filling machine; throw into the machine as much as it will hold, taking care there is no room for any air to get in afterwards, then press the mixture into small middle ox gut sausage skins. For hand filling a correspondingly wide Hörnchen should be put into the skin, so that it is more easily filled, and stuffed as tight as the skin will allow. To make the drying of the sausages sooner accomplished in winter, stand them upright in boiling water for three seconds.

The sausages must now hang in a well-ventilated room, the temperature of which is from 58° to 60° Fahr., until they begin to look somewhat red under the sausage skin, which usually takes from 14 to 18 days in dry weather. Now hang the sausages up in cold dry smoke in a high place, perhaps the third or fourth storey high, with air coming from above in an equal temperature of about 60° or 65° Fahr., and use for the purpose some dry oak and beach sawdust, mixing amongst this for the last and second last smoking a handful of juniper berries. One can also put in some maple and cedar sawdust, if possible (to be had where cigar-boxes are made), as these give the sausages a pleasant odour and a fine taste. Smoke the sausages until they become a fine cherry red colour, and keep them in a well-aired room until they are required for sale.

Remarks.

(1). For their manufacture good firm meat is required; choose pork of a dark red colour, without sinews; the beef must be bright red and from a well-grown, sound, healthy beast; both meats must be quite cool and well cleaned from every sinew; the bacon, which is to be used, must not be too fat, and should hang some days in the air, so that it may be better cut into small slices, and afterwards during the chopping may come into more equally cut dice.

(2). One requires particularly sharp mincing knives, so that the sausage is properly cut through and not squeezed or hacked, the latter giving the sausage a greasy appearance.

(3). If minced on a block it should one of firm white beech, for the special use of this sausage or others of the same sort, and should not be used for lungs or other boiled meat, as in these cases the liquor in which the meat has been boiled escapes from the meat in the chopping and gets into the block, and cannot be thoroughly removed, and consequently would flavour the raw meat disadvantageously.

(4). Above all, cleanliness is particularly necessary for the preparation, both for the taste and to make it keep.

(5). The skins used may be the middle gut of the ox, pig's fat end or calf's bladder, which must be cleaned from all fat and any small pieces adhering. Before using they must be carefully washed in warm water, and dried well inside and outside. They must then be cut a proper size and be tied up firmly. This must all be done the day before they are to be filled, and then they must be hung up, so that the next day they are perfectly dry.

(6). In frosty weather the sausages must be made in a moderately warm room in which, however, there must be no smell of cooking, and keep them when ready in a temperature of from 55° to 60° Fahr.

(7). *In summer* the following precautions must be taken:— Work in a cool room, and see particularly that the meat is perfectly cool. In order that this may be more surely and more quickly accomplished, especially with a heavy piece of pork, cut out all the bones as soon as the animal is killed, and hang up the meat outside in a cool place. Add 5 ounces more salt and about 8 ounces dry antiseptic to the block of mixture. This should be added along with the spices. The manufacture should be accomplished as quickly as possible.

The skins required should be steeped in (and quite covered with) cold water (into every half-gallon of which one ounce of dry antiseptic has been rubbed) for six hours, and then thoroughly dried (the *inside* of the skins must particularly have this antiseptic bath). There is then no chance of the goods spoiling afterwards.

Brose Meal.—Ground peas of special kind used in making puddings and sometimes for peas pudding.

Brown Paper.—see Wrapping Papers.

Brunswick Sardine and Liver Sausage.—To make 25 lbs. Brunswick Sardine and Liver Sausage, take

8 lbs. pig's liver.	6 lbs. fresh bacon.
7 ,, lean pork.	½ lb. good sardines.
4 ,, seam (raw pig's fat).	

Prepare in following manner:—

Cut the livers into small strips, wash them in cold water, and scald them well to make them white. Let them dry, then chop them. Add the lean pork (boiled, but not too tender), and chop very fine. Have the seam scalded, and add it and the bacon to the rest and chop all together. Now add the sardines and the seasoning, and mix thoroughly.

Seasoning—12 oz. salt, 1¼ oz. fine white pepper, ½ oz. fine white ginger, ½ oz. finely ground marjoram, ⅓ oz. thyme.

Fill this into skins about 9 inches long, not too tight, and boil them from twenty-five to thirty minutes. Don't prick them. After they are boiled, put them at once into cold water, changing repeatedly until the sausages are cold and firm.

Brunswick Sausage.—

13 lbs. fat and lean pork.
4 oz. salt (finely powdered).
1 ,, saltpetre.

2 oz. food preservative (dry antiseptic).
1 ,, finest ground white pepper.
¾ ,, peppercorns (white).
½ ,, powdered lump cane sugar.

Method of Preparation—Cut the pork up fine in the mincing machine, then add the seasoning and other ingredients, excepting the peppercorns, which add *last*, before removing from the machine. Fill into wide pork skins and link into ordinary lengths of six to the pound. It is sometimes considered better to *tie* each division instead of linking. Hang them up for four or five days in a cold current of air, so that they become dry and shrunken. If any slackness appears in the skins, tie the loose skin tight up to the enclosed meat, and hang them up in a cool place in the smoke house for about a month. It is usual to eat these sausages raw on the Continent, but that will not commend itself to British tastes. They form an excellent dish when cooked gently.

Notes on Ingredients.—Powdered lump cane sugar is added to impart the sweetness required. If care be taken to get cane sugar, there is no danger of fermentation setting in.

Brushing Machine.—see Meat Brushing Machine.

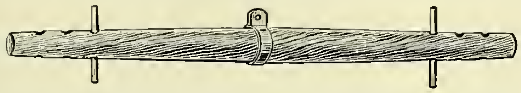
Brussels Mosaic Sausage.—This sausage requires careful preparation, but it is well worth it. Not only is it very tasty, but it presents a very pretty appearance when cut up, and looks well in the shop window.

Take a leg of pork (either fore-leg or hind-leg). Carefully remove all sinews, cut it up, and add to one-fourth part lean veal. Rub these well with a brine of saltpetre, salt, and Indian cane sugar, and let it stand for twenty-four hours in a stone jar, well pressed down and covered up, when it will have a fine red colour. For 15 lbs. of pork and 5 lbs. of veal, add 12 oz. salt, ½ oz. saltpetre, 1 oz cane sugar. After taking out of the jar, mince it fine, say to the size of lentils, adding the spices during the mincing. These are, 1 oz. white pepper, ⅓ oz. mace, ⅓ oz. ginger, ⅙ oz. cardamoms.

Now, put them into skins measuring about 6 inches in thickness and 7 or 8 inches in length. Fill them three-quarters full. To make the mosaic work now, cut up a fine red ox tongue in long four-cornered pieces, each wrapped round neatly with a piece of raw bacon fat—just a shred; also some fine blood sausage, Frankfort little sausage, or thin fine liver sausage. Then set them into the large sausage amongst the meat at equal distances, covering these other sausages also with the thin wrapper of bacon. Before setting them in, take a wet stick which is slightly thicker than the pieces for inlaying. Push this stick into the sausage, and then slip in the mosaic. If this were not done, the bacon would be pulled away from the pieces of meat it is wrapped round. When all the pieces have been carefully set in, tie up the sausages and hang them for an hour to smoke gently in a room about 64° Fahr. Then put them into a pot and let them simmer one and three-quarter hours. Both while smoking and cooking, and afterwards, stand the sausage straight, so that the inlaying may not be pushed off the straight. Then smoke them again lightly with sawdust to which some juniper berries have been added.

Bruton Bacon Factory.—see Somersetshire Bacon Factory.

Bullock Tree. — An appliance made of wood with iron clamps and pins for extending the quarters when the



bullock's carcase is being hoisted after killing. It enables the slaughter-men to split up and finish the carcase much easier than by ordinary close block and tackle.

Bungs—(Beef).—These are the large intestines, from the stomach to the smaller intestines, of an oz. They are usually from three to four inches in diameter, and should be of a fair pinky colour. The smell of them has a slight taint which disappears in the cooking. They are used for German and bologna sausages, head cheese, blood sausage, ham sausage, and average about 50 lbs. of meat to 1 lb. of skin.

Bungs—(Pig).—These are the intestines of the pig from the stomach to the rectum (which is called the crown), and are sold with or without the crown. They are used for summer and liver sausages.

Butter and Egg Storage in Belgium.—*Installation of "La Fermiere," Brussels.*—Belgium has many distinctive features that appeal with much interest to the stranger. The country is a small one, having an area of 11,373 square miles, or one-third the area of Ireland. The population is 23,895,413, and is on the increase, so making one of the most thickly populated countries in the world.

Baron della Faille.
Burgomaster of Huysse, President of the Creamery of Lozer-Huysse.

The country lends itself to agricultural pursuits owing to its flat nature, and hence we find that sixty-seven per cent. of the soil is under cultivation; seventeen per cent. being under forest.

M. le Comte de Briey.
President of the Administrative Committee of "La Fermiere."

No country offers a better example of the value of small holdings in land, inasmuch as the average farm does not exceed one hectare, or about two and a half acres, and the assiduous care with which every portion is tended, so as to make its produce as great as possible is a credit to the Belgians as a nation. Every means is utilised to improve agriculture by a system of education at endowed agricultural colleges and experimental stations, with the result that the produce from the land is yearly on the increase in the markets of Europe. In 1895 England imported goods from Belgium to the value of £17,545,169, and in 1899 this figure had increased to £22,861,967, out of a total value exported from Belgium of £80,327,321. England therefore takes about one quarter of the exported products of the country.

The more prominent items on the list of articles we receive from Belgium are eggs, pork, potatoes, and sugar. Strange to say, butter figures very low down on the list, and compared with a country like Denmark is hardly appreciable. This, however, is easily understood when the population of Belgium itself is taken into account and the requirements of the people.

During recent years a strong effort has been made by some of the more prominent Belgium noblemen to develop agriculture even more than at present, and with conspicuous success. One of the most successful is Baron Peers of Oostcamp, Bruges, and in the same category may be mentioned Baron della Faille, the Comte de Briey, the Comte de la Barre, Henri the Baron Kervyn, and Joseph the Baron

Kervyn. Associated with them is M. Remi Van der Plancke and many others. The Baron van der Bruggen, Minister of Agriculture, has also, as might be expected, taken a very lively interest in these matters, and assisted every scheme for the advancement of agriculture.

M. Van der Plancke.
Vice-President of the Union Laiterie Belge, Brussels.

In 1898 a congress was held in Brussels under the presidency of Baron Peers, and the vice-presidency of the Minister of Agriculture, with a view to considering the development of the dairy industry in Belgium, and part of a report subsequently submitted is of such interest that we may quote it here:

"La Fermiere,' Brussels.
Front View of Buildings.

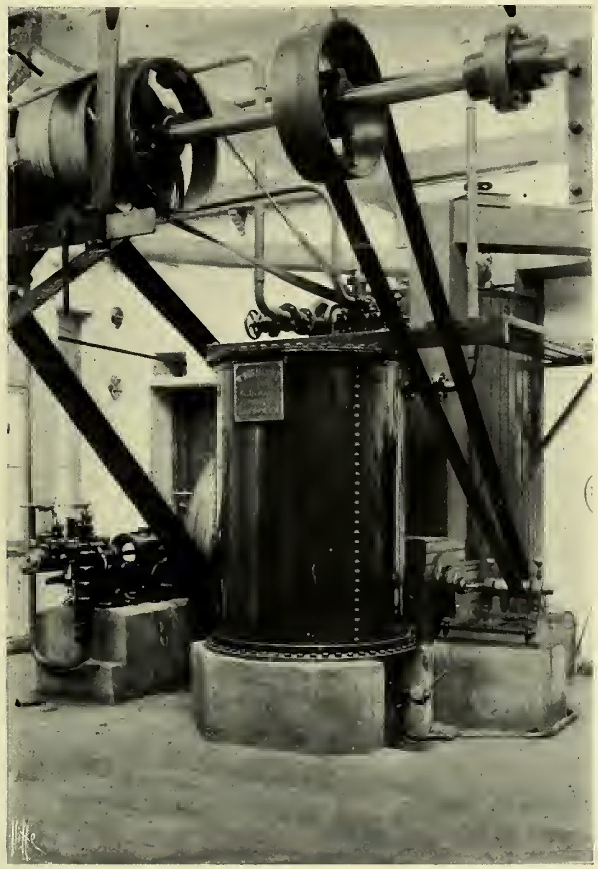
"In certain centres, it is stated by some, that the peasant is dull of understanding, and that it is difficult to make him receive any new ideas. The latter part of this statement

"La Fermiere," Brussels.
Water tank and roof over portion of yard, constructed on the Hennébique system.

may be more or less accurate, as our farmers are slow to consider new innovations, but it would be incorrect to say that it is due to want of intelligence.

"Those who have studied the peasant closely, can testify that his faculties are sufficiently developed to allow of his grasping at once the idea of anything which has been clearly explained to him, but he does not allow himself to be carried away by fine words, and is only convinced by proofs. If he does not immediately become very enthusiastic over anything new, it is simply because the advantages have not been made sufficiently evident to him. But once convinced, then nothing will keep him from going forward, and his enthusiasm equals his former opposition. Lectures, the newspapers, exhibitions, the efforts of the whole universe to prove the superiority of centrifugal skimming over the old methods, have certainly contributed much to awaken his curiosity. But he was not converted to the new system until some generous supporters of agriculture enabled him to prove for himself that by this new method only twenty-eight litres of milk were required to obtain a kilo. of butter instead of thirty-two by the old method. An innovation which permits of seven cows representing eight from the point of view of the production of cream must necessarily be a good one, and as one cow in every eight could be saved, why not two in every sixteen, and so on? This simple reasoning has been the means of duplicating, and even of trebling, the number of creameries where centrifugal skimming has made its appearance. Moreover, circum-

stances favour this movement; in proportion as one accounts for the constant diminution of the produce from the cultivation of crops and of beetroot, the cultivated fields will be used for pasture land. We are progressing slowly but



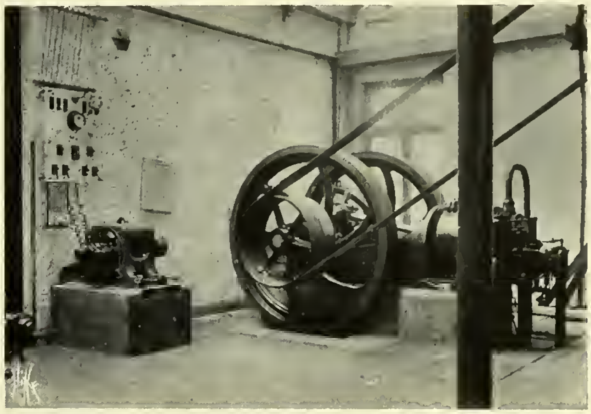
Refrigerating Machine. Condenser. Evaporator.
"La Fermiere," Brussels.
View of CO_2 Refrigerating Machinery.

surely towards a radical transformation of our system of agricultural cultivation which is happily favoured by the nature of our soil and of our climate; there has never been

"La Fermiere," Brussels.
Side View of Buildings.

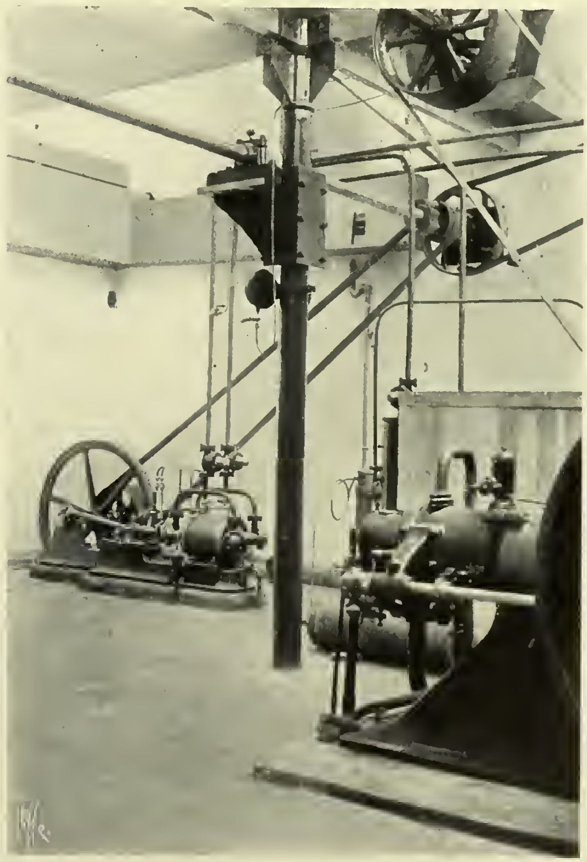
a time, going back more than a century, when our pasture lands have been destroyed either by the frosts of winter or the droughts of summer.

"The social question being the ruling factor, it appears that the extentions of our pasture lands by the diminution of cultivated lands will contribute in a certain degree to



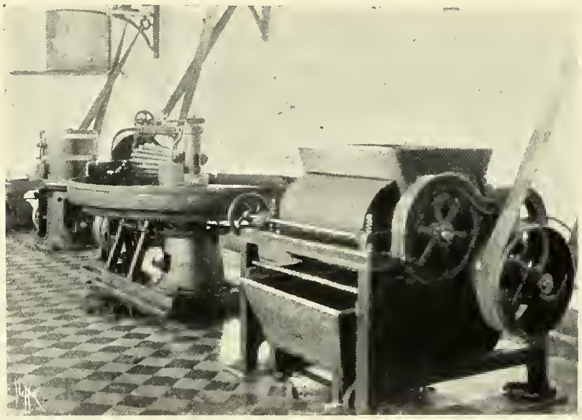
Motor. Gas Engine.
"La Fermiere," Brussels.
View in engine room.

keep in the country a number of rural labourers who are at present forced to come into the towns and compete with the town labourers, especially now that a great deal of work



Sulphurous Acid Machine. Auxiliary Gas Engine.
"La Fermiere," Brussels.
View in engine room showing auxiliary refrigerating plant for milk freezing.

in connection with the cultivation of land is done by machinery. As it is hardly likely that the milking of cows can ever be done mechanically in an economical and advantageous way, we must conclude from this that a



Vertical Butter Worker. Horizontal Butter Worker. Butter Mixer.
"La Fermiere," Brussels.
View of the butter workroom.

considerable increase in our cattle will result in a relatively large number of working men being employed in this business. The density of our rural population, far from being a drawback, will be a very great help towards the change

"La Fermiere," Brussels.
View in milk workroom.

which is taking place. But the obvious consequence of this change will necessarily be an immense production of butter, so that the selling price of it will be much below that which it costs the farmer now, if one does not at once take the matter in hand by organising without delay the exportation of all butter which is not required for consumption in the country. This surplus does not exist now, but we must look out for a market to meet this eventuality, because the arranging for a market, entails patient and laborious work. One cannot improvise it at the moment when the plenitude arrives. We must therefore be in advance, so as to have a market ready when the moment comes. How can we establish in England a market for our butter? Many opinions have been advanced, but one after the other experience has proved them to be failures, and we have at last arrived at the conclusion, that the only way of procedure is to supply a merchandise completely assimilated to the taste of the consumer, that

"La Fermiere," Brussels.
View inside one of the refrigerating chambers, showing brine drums.

is to say, a butter exactly identical with that which enjoys the preference, and which it would be possible to offer at a slightly lower price. To arrive at this we must institute a new industry.

"Between the work of dairymen who produce the butter, and the operations of the exporter who negotiates the sale of it, we must place this third 'wheel,' the industry of the butter dealer. Nowhere in our country, not even in the most important creameries, is butter produced in a sufficiently large quantity to be able to meet regularly at sufficiently close intervals the demands of the wholesale London market.

"At first sight it would seem as if the creameries of one district could unite and supply this want, but then the difficulty arises as to the absence of uniformity in the quality of the butter produced. Suppose, however, that in the whole country we were able by scrupulous similarity of method to produce a uniform butter, another difficulty presents itself, and the most important, which is, that no Belgian butter could combine the different qualities desired to make this special butter that suits the English taste, which is very delicate, the unreasonableness of which it is difficult to form an idea.

"In order to be able to supply the London market, having regard to quality as well as quantity, one must provide a butter industry, the work of which begins where that of the dairy ends. To provide such quantities of butter as are desired, it is necessary to obtain from all districts large supplies of butter, and bring them to one centre provided with refrigerating apparatus, so as to be able to supply fresh butter in a perfect state at all seasons of the year.

"Here the butter is classified, and all lots of the same quality are mixed and blended together so as to produce an absolutely uniform kind. It is to be noticed that in mixing butter, the blending of good with the mediocre qualities is not desirable. Some people think that to produce a middling quality they have only to do this, but it is much easier to impart a bad flavour to a good butter than for the good butter to improve the quality of the other, and this way of mixing leaves much to be desired. The mixing, therefore, must not be made from good and inferior butters, but from butters of the same quality. The butter production of Belgium lends itself admirably to this manipulation. The rich butter of the country imparts some of its richness to a poorer butter of another country; while a butter from another gives the flavour. The butter having been prepared, it is formed into rolls of shape and weight customary in London, then packed as required there, and sent off."

The result of this congress was the formation of a joint stock company under the name of the Union Dairies, which was started at Bruges, on January 10th, 1898, for the organisation of a butter industry and the exportation of butter.

This company seemed to have been started at the right time, as the produce of butter in 1897 had been very abundant, and as in the meantime the members of the society had grown, there seemed reason for predicting a plenitude from the spring of 1898. This anticipation did not prove correct. The appearance of the *Homatite aphteux*, which raged throughout all parts of the country, diminished during more than two years the quantity of milk, so that the quantity of butter produced was below the wants of the country.

The result was that the price in Belgium was higher than that of the London market, and the Union Dairies had to make great sacrifices to procure the butter necessary for export, as they had created a trade and must keep it up.

Owing to the scarcity of butter the society was not able to continue, and on 9th February 1900, wound up their business. The *Homatite aphteux* having disappeared, the dairy industry once more showed signs of great development, which suggested to those interested in the Union Dairies movement, that they might with advantage renew their combined efforts. Were their attempts and their sacrifices to be left without fruit? The former share-holders of the Union Dairies did not think so, and with the help of some other prudent friends, stimulated by the example of Baron van der Bruggen, Minister of Agriculture, who headed the list of subscribers, they got together new capital and formed on 10th May 1900, a new company under the style of "La Fermière," with a somewhat analogous programme to that of the other company.

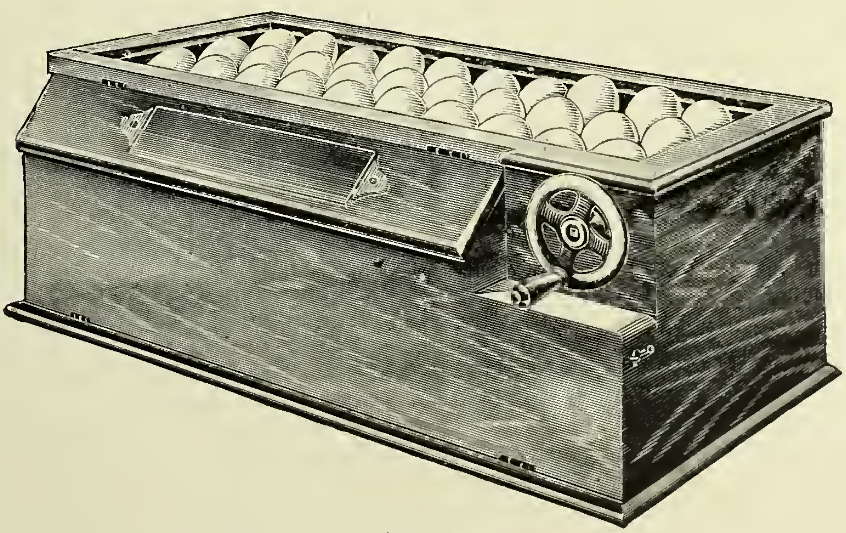
Profiting by the experience of the other company, the new society first of all made several resolutions.

In the first place, that to be profitable, the point of connection between the production and consumption should be clearly defined. It would be essential to have a central situation, that is to say, in the near neighbourhood of Brussels. With this object in view the company obtained a piece of land at Anderlecht of 12,000 square metres for the erection of their installation.

Experience also having proved to them that there is very seldom a great demand for butter both in Belgium and in London at the same time, they proposed to put down a refrigerating installation, and so keep the butter until the time of scarcity, as very often the London market would be buying when Belgium was not.

Also knowing that the greater number of the members of the Dairy Society had large quantities of eggs from their chickens, and having learnt that in America and England the practice of preserving eggs had been successfully carried out, La Fermière decided to go in for this egg preservation.

The society have added another item to their programme. Professor Helm, who is an authority on the dairy industry of Germany, general concessionnaire of the patents of Doctor Cam of Copenhagen, patentee of improvements relative to these and other inventions, has agreed with La Fermière relative to the monopoly for Belgium for these



Hand Egg Tester.

patents. Their principal object is to take from the milk all tubercular germs and to preserve it for some time in the fresh state.

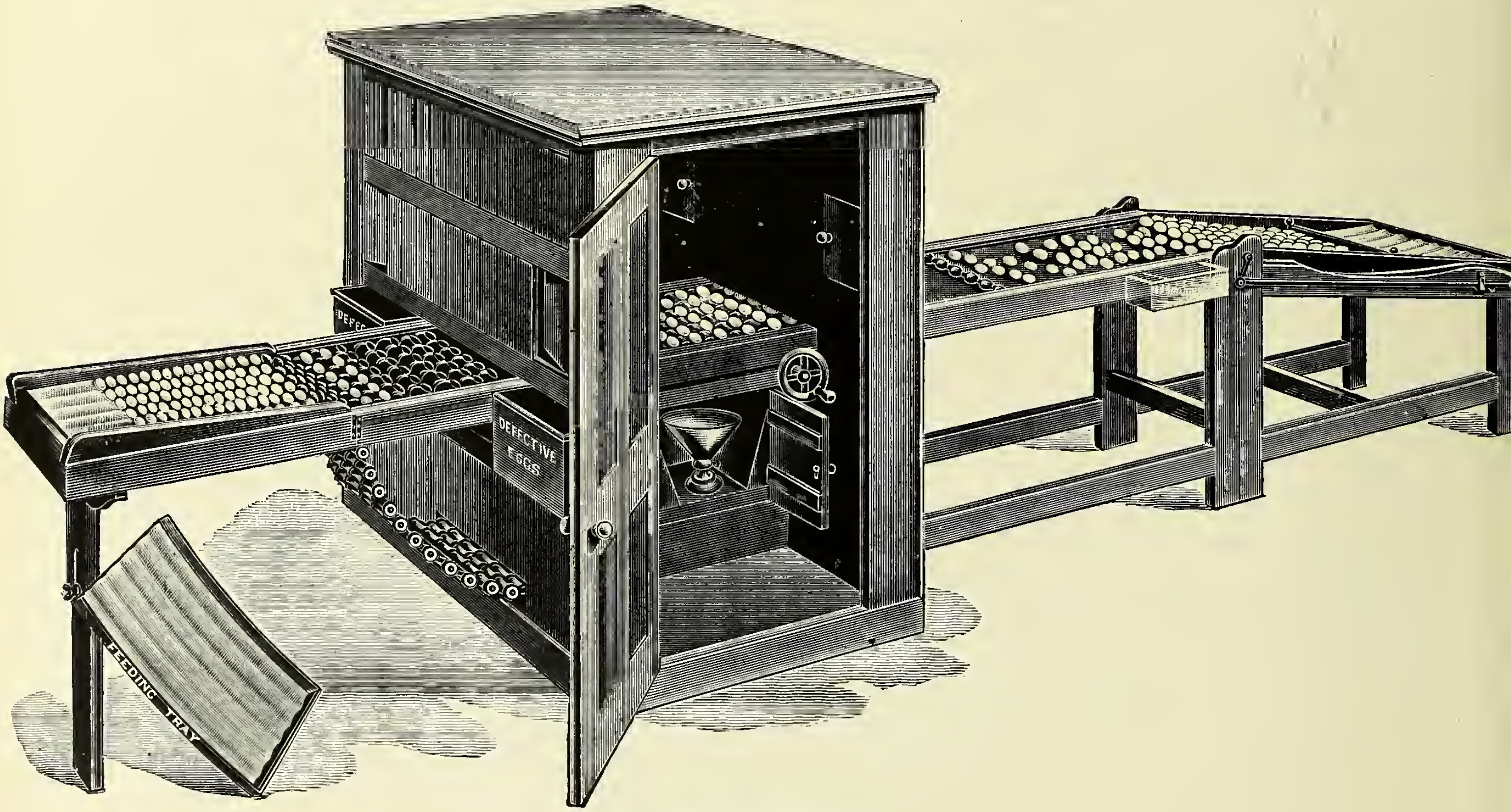
It is therefore intended to add the fresh milk business to that of butter and eggs.

La Fermière did not hesitate, and came to an agreement with MM. Casse and Helm, justifying once again the old adage "*Omne trinum perfectum.*"

The administrative committee of La Fermière is composed as follows:—President: The Comte de Briey, former member of Parliament, president of the Creamery St Joseph at Virton. Members:—Baron della Faille of Huysse, member of the provincial council of East Flanders, Burgomaster of Huysse, and president of the creamery of Lozer-Huysse. The Comte de la Barre d'Esquelinnes, commissionaire for the proprietors. M. Remi Van der Plancke, butter merchant, vice-president of the Union Laitière Belge, Brussels.

"La Fermière" is the title adopted to distinguish the installation carried out in the Rue d'Itterbeck Anderlecht-Brussels. The primary object of the administration is to provide commodious premises wherein eggs and butter may be stored from the plentiful season in the summer till autumn, when both these commodities are scarce. It is believed that a handsome profit will be derived from the increased price which will naturally be obtained. Indeed, this fact has been demonstrated so well elsewhere that no doubt remains that the project will be successful. The buildings are of the most commodious character, and are capable of storing 2,500,000 eggs, and 300,000 kilogs. of butter, leaving spaces between packages for convenient examination. The buildings are rectangular in shape, and the various departments are made to fit in conveniently the one to the other. The front presents a very handsome appearance, and includes the offices, dwelling house for the concierge and assistant engineer, and stables—this part having been designed by Mr Roy of Verviers, architect. Immediately in the rear is a courtyard partially covered, one of the principal features of which is the use that has been made of the patent system Hennebique in the construction. The covered portion also has, as part of it, a large water tank, and this has been constructed of the same material. Roughly speaking, the Hennebique system of construction is in cement concrete, strengthened by means of iron rods. Hence, columns which appear to be very slender are equal to an enormous crushing strain. Water, being the one essential for the refrigerating plant, is provided in the large tank, which is also fitted with complete spraying apparatus protected by wood baffles. This enables a limited supply of water to be used for condensing purposes over and over again, the only loss being due to evaporation. The spraying or finely dividing up of heated water enables the heat to be taken up by the surrounding atmosphere, and so the water becomes cool by the loss of this heat.

The main building, with its equipment of mechanical appliances, was constructed from the designs of Messrs William Douglas & Sons Ltd., of Putney, London, who supplied and fitted the whole of the machinery and insulation necessary.



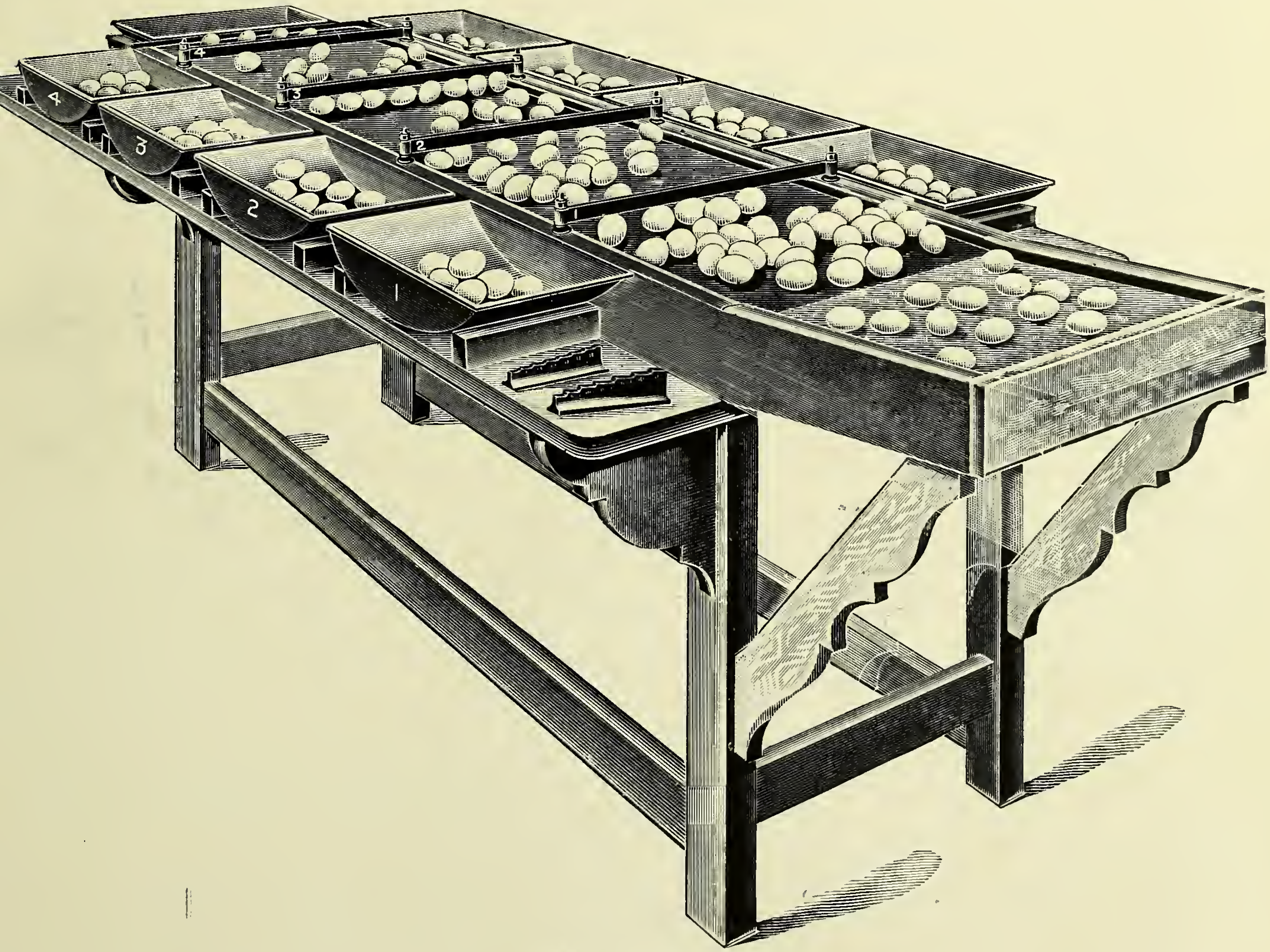
Egg Testing Machine.

Engine Room.—The engine room is fitted out with a carbonic anhydride refrigerating machine (Hall's patent) of the horizontal type, and having separate condenser and evaporator. It has a capacity of five tons of ice made per day, or a cooling effect of ten tons of ice melted. The number of B.T.U. that it will eliminate are 190,000, equal to 48,000 calories. Power is derived from a horizontal gas engine of forty-three brake horse-power, and the same power is utilised to drive the butter factory, which forms a necessary complement of the scheme. A small refrigerating machine on the sulphurous acid principle and a dynamo are driven from an auxiliary gas engine. This machine is utilised to freeze the milk in connection with the installation of Messrs Casse & Helm, which has been installed in a specially constructed annexe.

Main Workhall.—A butter factory is necessary in connection with such a scheme so as to enable butter to be received in the lump and graded into a uniform appearance. The machines in this factory are a rolling machine (Lisseuse), a horizontal butter worker (Malaxeur horizontal), and a vertical butter worker (Malaxeur vertical)

Refrigerated Chambers.—These are five in number, and the system of cooling is the same throughout. The principal effect is produced by the circulation of brine in brine drums, and is aided when necessary by the circulation of cold air from a cooler made up of pipe grids in which brine is circulated. The air of the chambers, or any one of them, can be passed over this cooler at will, the moisture taken out, and the air returned to the chambers in a freshened state. Brine drums are a comparative novelty. They are just large pipes eight inches in diameter constructed of thin iron plate, so that the absorption of heat is very rapid. The large body of brine presented to the surrounding atmosphere, as represented by these drums, enables a very great amount of heat to be absorbed, and this has the advantage that when the machinery is at rest, and the brine consequently not circulating, a constant temperature in the rooms is assured

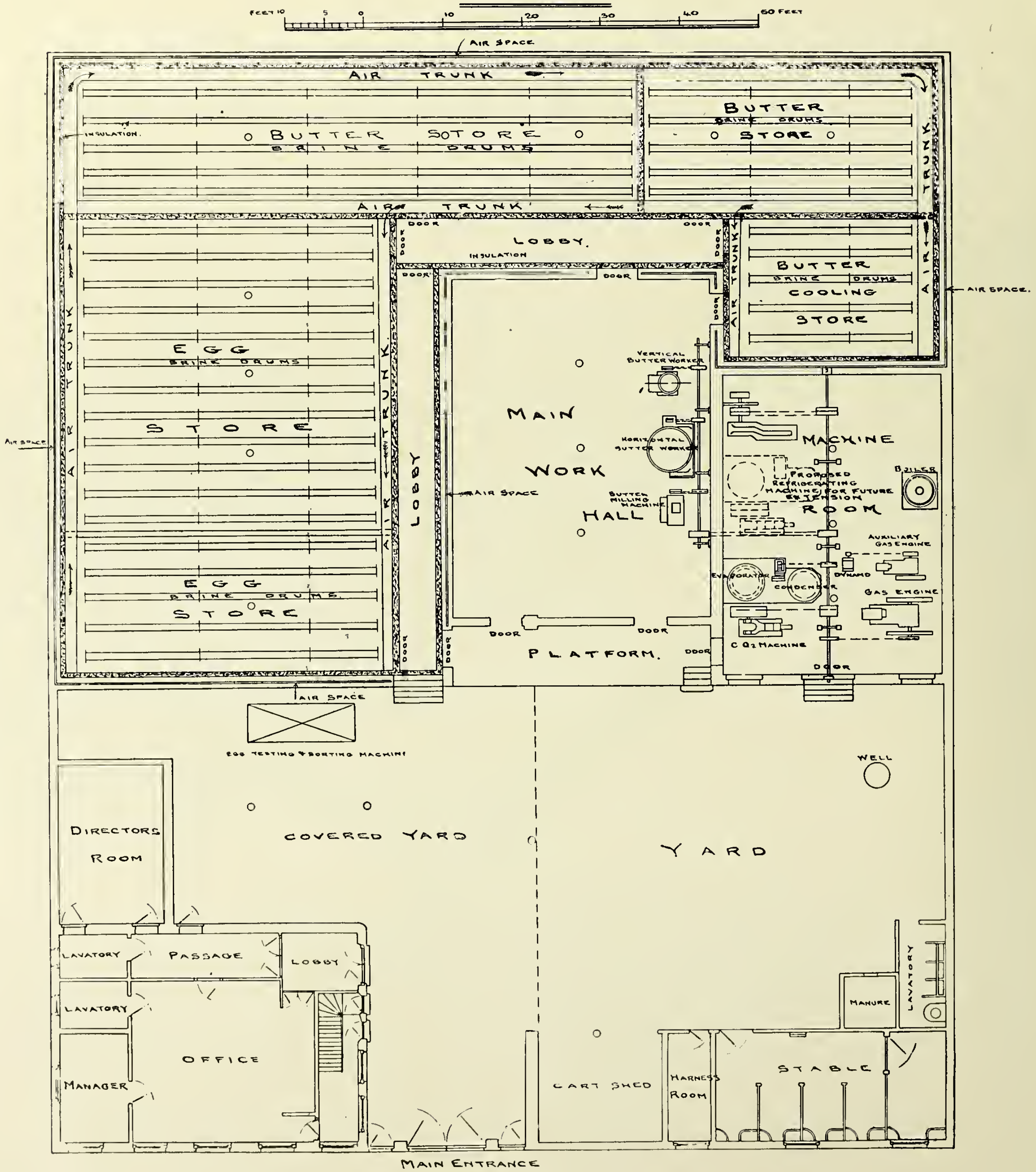
The Butter Chambers.—The principle on which the butter will be stored is that of chilling first and then removing into a permanent store. The outer store will be utilised for receiving the freshly packed butter, and the heat will be taken out of it in the cooling room. When it has reached



Egg Grading Apparatus.

LA FERMIERE. BRUSSELS.

1/8 IN = 1 FOOT.



GROUND PLAN.

28° Fahr. it will be removed into the butter stores, there to wait until wanted at a later date.

The Egg Chambers.—The process with the eggs will be very carefully carried out. First of all, when the eggs arrive, they will be inspected quickly by means of an egg-testing machine. One of these machines has been installed in a separate chamber close to the egg chambers, and can be worked up to a capacity of 1400 eggs inspected in three minutes. A smaller machine for limited quantities may also be used. The large machines measure over all thirteen feet long by seven feet high, and consist of a frame fitted with an endless moving carrier propelled by hand. The carrier is constructed of bobbins fitted closely together and lined with cloth, thus affording an accurate hollow into which to place each egg. The centre portion of the frame is covered with a dark cabin, through which the endless carrier is moved. Beneath the carrier at the portion which traverses the cabin is a powerful lamp or electric light, and as the eggs are passed over this the bad ones are easily detected by their dark colour or spots. The eggs are fed on trays to the machine, and the process of inspection is exceedingly rapid. When the eggs have been inspected they are placed in cases of from three to five hundred, the small package being preferable for convenience of handling. The cases are first taken into the outer egg store, where they are reduced to a temperature of about 33° Fahr. They are then carried into the large egg store, and kept there until the time comes for their removal. This general store should be kept at a temperature of just below freezing. An important point to watch in the storage of eggs is the humidity. This is determined by means of a hygrometer and hygrometer tables. The percentage of moisture in the atmosphere should not vary.

In the construction of the cold rooms it has been arranged that there should be a large air lock or lobby. This will prevent any contact between the air of the chambers and the outside atmosphere—a very important point, inasmuch as the cold air of a chamber will simply roll out like water unless some barrier like an air lock is there to prevent it. The doors opening to the air lock should never be open at the same time as the doors of the chambers when the latter are in work.

This venture in Brussels is being watched by many people in Belgium and out of it, as upon its success much depends. Nothing less indeed than a new era in agriculture will have commenced should this undertaking be the success anticipated.

Burning of a Butter Cold Store in Cork.—see Insulation.

Butchers' Blocks.—see Hornbeam and Maple Blocks.

Butchers' Federation.—see National Federation of Meat Traders' Associations.

Butchers' Charitable Institution.—An institution founded in London on 16th October 1828, for affording relief to decayed and distressed master butchers, master pork butchers, cattle and meat commission salesmen, and hide and skin salesmen, their widows and orphans.

His Majesty the King, as Prince of Wales, was patron of the institution.

The officers of the institution for 1900 were as follows:—

President.

JAMES KILLBY, Esq., 90 London C.M. Market.

Vice-Presidents.

Mr Alderman ALLISTON, 46 Friday Street, London, E.C.
J. BLOFELD, Esq., Ellesmere, Green Lanes, Finsbury Park, N.
FREDERICK CHALK, Esq., Aberdeen House, Forest Hill.
J. W. FRANKLIN, Esq., 12 Westbourne Terrace, Chiswick.
HENRY GRANT, Esq., 5 King William Street, Strand.
W. G. GUERRIER, Esq., 177 Camden Road, N.W.
W. HAYDON, Esq., L.C.C., 1 Tulse Hill, Brixton.
ALFRED HAYR, Esq., 131 London C. M. Market.
HENRY M. HILL, Esq., 66 West Smithfield, E.C.
JNO. HILL, Esq., 66 West Smithfield, E.C.
ALFRED LYON, Esq., 104 London C. M. Market.
W. MALTHOUSE, Esq., C.C, 132 London C. M. Market.
H. B. MARSHALL, Esq., M.A., J.P., C.C., Temple House, Temple Avenue.
PETER MEECH, Esq., "Verandah," 146 Romford Road, Stratford.
GEORGE STEPHEN NIXON, Esq., 154 Essex Road, N.
T. GURNEY RANDALL, Esq., 40 England Lane, Hampstead.
Alderman and Sheriff Sir W. P. TRELOAR, 69 Ludgate Hill, E.C.
B. W. VENABLES, Esq., Fairmead, Seven Sisters Rd., Finsbury Park.
STEPHEN WEST, Esq., "Tregenna," Wellesley Road, Croydon.
T. WOODLEY, Esq., 54 South Hill Park, Hampstead.
A. VAN ZWANENBERG, Esq., 74 Highbury New Park, N.

Treasurer.

THOMAS KILLBY, Esq., 90 London C. M. Market.

Trustees.

ROBERT CALCUTT, Esq., Avening Lodge, Avening, near Stroud.
HENRY S. FITTER, Esq., 142 London C. M. Market.
CHARLES GAME, Esq., C.C., 48 Lee Park, Blackheath.
F. J. GREEN, Esq., Silsoe Villa, Ealing.
ALFRED SLATER, Esq., 5 Russell Road, Kensington.
EDWARD SMITH WEEDON, Esq., 117 Fore Street, E.C.
JOSHUA WILLIAMS, Esq., 6 Vernon Road, Clapham.

Committee.

Mr J. BLOFELD, Junr., 140 Whitecross Street, E.C.
,, T. W. BLOTT, 6 Church Street, Kensington.
,, W. F. BONSER, 29 London C. M. Market.
,, J. BUDGE, 167 Clapham Road, S.W.
,, G. H. CLEARE, 334 Brixton Road, S.W.
,, W. COGGAN, 5 Point Street, Belgrave Square.
,, W. COOPER, C.C., 26 London C. M. Market.
,, W. R. COULTHURST, 6 Russell Gardens, W.
,, GEORGE EVERETT, 1 Old Queen Street, Westminster.
,, H. V. GAME, 10 Clarendon Road, Lewisham.
,, ALBERT N. GARTON, 117 London C. M. Market.
,, H. J. GRANT, 5 King William Street, Strand.
,, JOHN HALL, 101 Green Street, Bethnal Green.
,, J. T. HART, 301 London C. M. Market.
,, WILLIAM HILL, 1 Old Queen Street, Westminster.
,, W. F. MASTERS, 51 London C. M. Market.
,, E. G. MEARS, 87 London C. M. Market.
,, J. E. PAINE, 40 Gloucester Road, Finsbury Park.
,, E. GURNEY RANDALL, 40 England Lane, Hampstead.
,, J. GURNEY RANDALL, 82 High Street, Highgate.
,, A. RODDA, 129 London C. M. Market.
,, PERCY S. SMOUT, 39 Mount Street, Grosvenor Square.
,, F. W. SPELLACY, 104 London C. M. Market.
,, W. E. SUTTON, 143a London C. M. Market.
,, P. TOCHER, 45 London C. M. Market.
,, A. P. VENABLES, Addington Lodge, 81 Crouch Hill, N.
,, JAMES WARREN, 375 Brixton Road, S.W.
,, F. L. WATERS, 51 The Gardens, East Dulwich.
,, T. WEBBER, 3 Slaithwaite Road, Lewisham.
,, W. WEBBER, 23 Arragon Road, Twickenham.
,, F. WILLIAMS, Skin Market, Bermondsey.

Bankers.

Messrs HILL & SONS, 66 West Smithfield, E.C.

Secretary.

Mr H. J. V. PHILPOTT, Solicitor, Butchers' Hall, Bartholomew Close, E.C.

Collector.

Mr G. B. POOLE, 15 Haycroft Road, Brixton Hill.

Rules and Regulations of the Institution.—1. That this institution be named "The Butchers' Charitable Institution," and that its funds be devoted as charitable funds to the relief of decayed and distressed master butchers, master pork butchers, cattle and meat commission salesmen, and hide and skin salesmen, their widows and orphans.

2. That the affairs of this institution be managed by a president, vice-presidents, treasurer, seven trustees, and not less than twenty-five other qualified members, who shall form the committee; five to be a quorum.

The qualification of a member of the committee shall be a donation of five guineas or upwards, and an annual subscription of one guinea, or a donation of twenty guineas or upwards.

The president, vice-presidents, and treasurer, and three auditors, to be elected annually at the general meeting in January.

The trustees shall from time to time, as vacancies occur, be chosen out of the committee at any general or special general meeting of the donors and subscribers.

All funds and property of the institution shall from time to time, as occasion may require, be vested in the trustees, who shall hold the same, and the rents, issues, and profits, interest, dividends, and proceeds thereof, upon trust for the institution, and shall from time to time, declare such trust thereof, and pay and dispose of the same as the committee of the said institution shall direct.

Ten of the elected members who have attended the fewest number of meetings in the year shall go out, but be eligible to be re-elected by the donors and subscribers at the annual general meeting.

3. A general meeting of the donors and subscribers to be held annually, in the month of January, to elect president, vice-presidents, treasurer, three auditors, and members to complete the committee, and to alter or amend the present rules and regulations, and to make new ones, and for general purposes. Ten days' notice prior to the meeting to be received by the secretary of the intention of any donor or subscriber to propose to alter or amend any rule, or to make a new one, and the notice to be advertised.

4. All annual subscriptions to become due on the 1st of January in each year.

5. An annual subscriber of one guinea to the charity, or building, or sick fund, to be entitled to one vote for each candidate to be elected, and so on in proportion for every guinea annually subscribed to either fund. No member to vote at any election whose subscription shall be in arrear.

6. A donor of five guineas to the charity, or building, or sick fund, to be entitled to one vote for life, at elections of pensioners, and every additional donation of five guineas to entitle the donor to an additional vote for life. A donor of any sum less than five guineas to be entitled, for every guinea paid, to a vote at the next succeeding election only, unless deferred at his own request by notice to the secretary. Any person paying to the charity any money, not being a donation or subscription, obtained wholly or principally by his personal efforts, to be entitled for every guinea paid, to a vote at the next succeeding election.

7. The committee, or any thirty subscribers, to have power to call a general meeting, by signing and addressing a requisition to the secretary, stating the object of such meeting and giving fourteen days' notice; and at any such meeting, there being not less than thirty subscribers present, three-fourths of such subscribers may make any rules and regulations concerning the institution, but no such rule or regulation shall be valid, except and unless the same be confirmed at a subsequent annual or special general meeting.

8. That the committee shall invest in Government securities or freehold property, or on mortgage of real property, or in the debentures or debenture stock of any railway company in England, all legacies, and so much of the donations and income of the charity as they may deem expedient. And no investment shall be varied unless notice of intention to propose to vary the same shall have been given in the notice convening the meeting of the committee.

9. An executor paying a legacy of fifty pounds and upwards, to be a member for life; if more than one executor, the one first named in the will to be entitled to the privilege.

10. All legacies are to be made to the treasurer for the time being, whose receipt shall be an effectual discharge for the same.

11. The committee, from time to time, shall have the power to determine the number of pensioners to be elected.

12. Pensions to be payable on the first Wednesday in each month, and to be as follows:—Males (married) 14s., males (single) 10s.; females, 8s. per week.

13. Such persons only shall be allowed to be candidates for pensions as shall be deemed by the committee to be suitable and proper subjects to receive the benefits of the charity. Every person desirous of becoming a candidate for a pension must be recommended by at least four house-holders (not being members of the committee), and the committee shall judge of the propriety of admitting the person so recommended as a candidate.

14. Every proposed candidate must give, to the satisfaction of the committee, proof of having carried on one of the trades mentioned in rule 1, for at least fifteen years, within fifteen miles of the General Post Office, St Martin's-le-Grand, and that during that period he gained his living thereby, and did not at the same time occupy the position of a servant in any capacity, receiving wages as such, or be the widow of a person who has so carried on such trade; and in the case of a widow, she must have been married to her husband, on whose account she claims to be admitted a candidate, at least five years before he quitted such trade. The wife of a person who has carried on any of the trades mentioned in rule 1, and who upon the death of her husband, would be eligible as a candidate, shall, in case of desertion by her husband, upon obtaining a magistrate's order of protection, be eligible for admission as a candidate, but, upon election, shall receive the pension only so long as the managing committee may deem advisable, and such pension shall cease to be payable from such time as the committee shall direct. Every applicant must, on the 1st of July, immediately preceding the day of election, be at least sixty years of age, except in the event of inability to labour, such inability to be verified by the certificate of the medical officer of the institution. The committee may, however, admit a candidate where one of the trades mentioned in rule 1. shall have been carried on for not less than ten years, and may also waive the restriction of fifteen miles in exceptional circumstances.

15. The election of pensioners to be by ballot, and all votes given in favour of unsuccessful candidates shall be registered to their respective accounts, and the same shall be brought forward in their behalf at every succeeding election; and any donor or subscriber may give his or her entire votes to any one candidate, or divide the same among the number

of candidates to be elected at any election; and the donors or subscribers, who cannot personally attend the election, may vote by signing and sending their polling paper to the secretary before the day of election.

16. At the second meeting of the committee following each election of pensioners, such committee shall be empowered to place one pensioner on the funds of the institution, providing the person so to be placed on as a pensioner shall have been an unsuccessful candidate at three elections. And if there shall be more than one unsuccessful candidate at three elections, the committee shall consider and enquire into the circumstances of all such unsuccessful candidates. The committee shall also at the same meeting, be empowered to award any sum not exceeding £1 a calendar month to any unsuccessful candidate at three elections, until elected a pensioner.

17. The committee to have the power at their discretion, and having regard to the circumstances of any particular case of increasing, or lessening, or discontinuing the pension, and in the event of any pensioner ceasing to reside in the United Kingdom, the pension to cease.

18. At the death of any pensioner or wife of any pensioner, the committee may award any sum not exceeding five pounds to the husband, relations, or friends of the deceased.

19. The committee are empowered to make an allowance not exceeding £10 per annum to any one family, to or for the benefit of the widow or orphan children of any person carrying on either of the trades mentioned in the first rule; and in the event of the death of a male pensioner leaving a widow (duly qualified to become a candidate), either to place her on the institution as a pensioner, and to pay her the current month's income or pension without the necessity of an election, or at their discretion, to make an allowance of £5 per annum, payable quarterly, to such widow until she shall be elected a pensioner. The committee in all such cases having regard to the administration of the fund as a charitable fund.

20. That the pensioners on the funds of the charity shall be eligible to be elected into the almshouses, and when so elected, each pensioner shall be allowed one hundred-weight of coals per week, from Michaelmas Day to Lady Day, and one hundred-weight of coals for every two weeks from Lady Day to Michaelmas Day in every year, and twelve pounds of candles during the year; and in the event of lunacy or other infirmity happening to any of the pensioners in the almshouses, the committee shall be at liberty to expend any sum not exceeding £15 per annum, beyond the amount of the pension for the benefit of such person at an asylum, or hospital, or otherwise.

21. At the annual general meeting in January, three auditors shall be appointed to audit the accounts of the institution for the current year. That the balance sheet be signed by at least two of the said auditors, who shall also certify as to the invested property of the institution.

22. The committee to appoint a secretary, who is to keep the accounts and summon and attend all meetings of the institution, and give such assistance from time to time as the committee may deem necessary, and be paid such salary or compensation as the committee may determine.

23. The committee to have power from time to time to make bye-laws for the due management of the institution.

24. The committee to appoint collectors, who are to be allowed £5 per cent. upon all annual subscriptions, with an additional £5 per cent. upon the first year's subscriptions of all new subscribers obtained by them, and also £5 per cent. upon all donations obtained by themselves.

25. The secretary and collectors to give such security as the committee may deem necessary.

26. The committee to appoint, at their discretion, a chaplain, doctor, nurse, and lodge keeper, and to pay them such salaries or remuneration as they may determine.

In January 1900, there were sixty-five male and seventy-four females pensioners, of whom twenty-one males and thirty-four females were in the almshouses.

The latest report of the committee is as follows:—

The Seventy-second Annual Report of the committee of the Butchers' Charitable Institution, presented to the general meeting of the donors and subscribers, held at the Butchers' Hall, Bartholomew Close, in the City of London, on Wednesday, the 9th day of January 1901.

"Your committee regret that notwithstanding the appeal to the friends of the institution contained in their last report, the annual subscriptions have decreased by over £60, and that the expenditure for the year has exceeded the income by £80, 5s. 6d. They earnestly appeal to all friends to assist them in order that at the close of the ensuing year, a more satisfactory report may be made.

"Your committee have the pleasure to report that Mr John Henry Lile, C.C., chairman of the central markets' committee, kindly consented to preside at the Seventy-second Anniversary Festival in aid of the funds, when the satisfactory amount of £886, 14s. was announced.

"Your committee desire to point out that Mr Lisle personally canvassed the central markets on several occasions, and in every way did his utmost for the benefit of your institution, and they desire to tender to him and the stewards the warmest thanks of the donors and subscribers.

"On the 12th day of June last, the Twenth-eighth Annual Garden Party was held at the almshouses. The Right Honourable The Lord Mayor and Lady Mayoress, supported by Alderman and Sheriff Sir W. P. Treloar and Lady Treloar, Mr William Haydon, L.C.C., Worshipful Master, and members of the Court of the Butchers' Company, and your president, Mr James Killby, honoured the proceedings with their support. Your committee are pleased to report that the entertainment was very successful, and resulted in an addition to the funds of £712, 15s. 1d. (including donations) £25 of which has been appropriated to the sick fund.

"Your committee offer their warmest thanks to the above mentioned ladies and gentlemen for their kind interest in the welfare of the institution, to Mr Thomas Williams for his valuable gift of cutlery, thus continuing the precedent of his late father, to Mrs Van Zwanenberg, Mrs Duckworth, Mrs M'Laren, Mrs and Miss Warren, Mr Percy Killby, Mr Gardner, Mr Broughton, Mr Rushbrooke, Messrs Duckworth Bros., Mr Thurling, Mr Darrington, Messrs D. Hart & Co., Mr Game, Mr William Hill, Mr Mason, and Mr L. Van Zwanenberg, for their kind services and contributions. To the honorary secretary, Mr Thomas Webber, whose services were most valuable, and to all the other ladies and gentlemen who assisted on the occasion.

"With pleasure your committee thanks Mr Peter Meech, for his usual kind gift of coals, Messrs Everett and William Hill, for their kind gift of joints of meat, and Mr and Mrs Henry S. Fitter, for their kind gift of tea and almanacs to the inmates of the almshouses at Christmas.

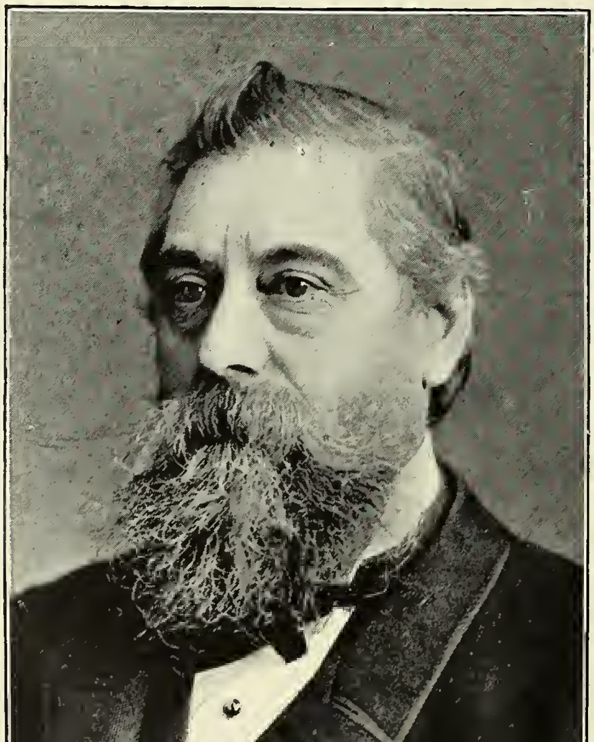
"The treasurer has received under the will of the late Mrs Emma Knight, a legacy of £100; under the will of the late Mr John Ticehurst, a legacy of £50; and under the will of the late Mr William Ticehurst, a legacy of £100. The two first mentioned legacies, less duty, have been invested in the purchase of India £3, 10s. per cent. stock, and the last mentioned legacy, less duty and costs, will be similarly invested in due course.

"Your committee are grieved to report the deaths of the following friends of the institution: Mr F. Chalk, Mr G. B. Frost, Mr W. Gascoine, Mr William Haarer, Mr G. H. Mason, Mr Josh. Renew, Mr C. Robinson, and Mr William Strong.

"At the annual election ten men and three women were elected pensioners. There are at the present time sixty-three male and seventy-four female pensioners, of whom sixteen males and thirty-three females are in the almshouses."

(Signed) JAMES KILLBY.
,, J. E. PAINE
,, J. T. HART.

Butchers' Jury.—The jury system as applied to meat seizures was the outcome of a movement started by the late Mr John H. Rodway, of Birmingham, and has been of incalculable benefit to the trade as a whole. Meat inspectors had been inclined to be a trifle despotic; and often used their powers to an extent never contemplated by the legislature. They would enter a shop; seize a piece of meat on the mere suspicion of its being unfit for human food, and forthwith without more ado, the case was decided against the meat purveyor.



The Late Mr John H. Rodway, Birmingham.

Mr Rodway insisted that a jury of butchers should be allowed, at the request of any tradesman, to examine the seized meat and try the case or at least see that justice was done, and after long deliberation the Town Council of Birmingham eventually agreed to the proposal. The system worked so well that it soon spread to other towns, and to its operations may be traced the doing away with the strained relations that formerly existed between the trade and the authorities. Inspectors, knowing that a jury of experts can demand reasons for condemning any food, have adopted a more reasonable position, and the authorities as well as the trade are satisfied. The public are also protected in a better way than before, as the trade have done their utmost to make the jury system a reality, with the result that food really unfit for consumption is never knowingly allowed to be offered for sale. The honour of the trade is at stake and the system gets fair play. It was only a strong man with sound ideas who could carry such a system into action, and the trade were fortunate in finding such a one in the late Mr Rodway.

Butter Analysis. — The following is an interesting series of tests of foreign-made butter carried out by the United States Government in 1899.

Samples of Foreign-made Butter, from English Markets, Examined in the United States, 1899.

Percentage, Composition, and Score of Foreign Butters.

Sample No.	Origin of Samples.	Water	Fat.	Curd.	Ash.	Score at Sioux Falls.		
						Flavor, 50.	Grain, 25.	Total 100.
1	Denmark	13·02	84·02	1·58	1·38	44	25	94
2	Do.	15·04	82·27	1·33	1·36	41	25	91
3	Sweden	13·64	83·45	1·65	1·26	42	25	92
4	Finland	13·08	83·97	1·68	1·27	34	25	83
5	Friesland	13·49	82·63	1·46	2·42	29½	23½	78¼
6	Holland	12·36	84·51	1·21	1·92	28	23	76
7	Denmark	15·32	81·18	1·48	2·02	32½	23¾	81
8	Ireland *	11·54	84·58	1·23	2·65	30	25	80
9	Do. *	15·02	80·95	1·63	2·35	24	23	70½
10	Do. *	18·42	71·26	1·99	8·33	33	24	80
11	Do. *	14·10	84·33	1·06	0·51	28	22	75
12	Do. *	13·11	83·59	1·08	2·22	29½	25	77½
13	France	15·10	82·94	1·52	0·44†	25½	22	71½
14	Australia	10·06	86·15	1·24	2·55†	30	25	80
15	Do.	10·83	85·89	1.10	2·18†	33	25	83
16	Argentine	12·15	84·89	1·01	1·95†	25½	25	75½
17	New S. Wales	11·60	84·55	1·41	2·44†	34	25	83
18	Do.	12·28	82·93	1·13	3·66†	34	25	84
19	New Zealand	11·48	86·08	0·81	1·63†	41½	25	91½
20	Canada	10·35	86·79	1·20	1·66	35	25	85
21	Do.	11·50	85·07	1·28	2·15	35	25	85
22	Victoria	11·92	34·86	1·25	1·97†	34½	25	84½
23	United States	12·96	83·95	1·33	1·76	32½	25	80
23a	Do.	13·24	82·47	1·09	3·20	32½	25	80½
24	Do.	13·55	84·22	0·87	1·36	38	25	85½
24a	Do.	13·17	84·59	1·05	1·19	37	25	84½
25	Ireland	12·73	84·00	1·38	1·89†	24	23	72
26	Do.	12·50	84·22	1·21	2·07†	22½	23	70½
27	England	13·54	85·44	0·34	0·68.	41½	25	90½
28	France, Normandy	14·99	83·19	0·68	1·14†	35	24½	84½
28a	Italy	14·89	83·57	1·30	0·24†	40½	25	90½
29	Friesland	12·34	85·06	1·65	0·95	37½	25	87½
	Am. Prem.:							
30	1st prize	12·46	83·31	1·55	2·68	47	25	97
31	2nd prize	10·49	85·68	1·38	2·45	46½	25	96½
32	3rd prize	10·66	85·82	1·28	2·24	46¼	25	96¼

* Winter-made butters out of season.
† Boracic acid preservatives present.

Signed by HENRY E. ALVORD, Chief of Dairy Division U.S. Department of Agriculture, Washington, D.C.

Butter Factories in Ireland.—(Written Oct. 1899). We are enabled to give our readers the advantage of two glimpses into a great modern butter factory. These views are unique in their way, as the manufacture of "factory" butter has always been kept a secret. The views are of the factory of Messrs M. E. Shanahan & Son, Cork, the originators of the "factory" system in the United Kingdom.

Messrs Shanahan have occupied their present extensive premises in Dunbar Street, Cork, for some thirty-five years, and twenty-five of these as a butter factory. In the early part of the seventies, factories were practically unknown outside of France, and were there mostly confined to Brittany. Now, they are pretty general throughout the United Kingdom and are likely to spread very much in years to come to judge from appearances.

Butter Working and Packing Room.

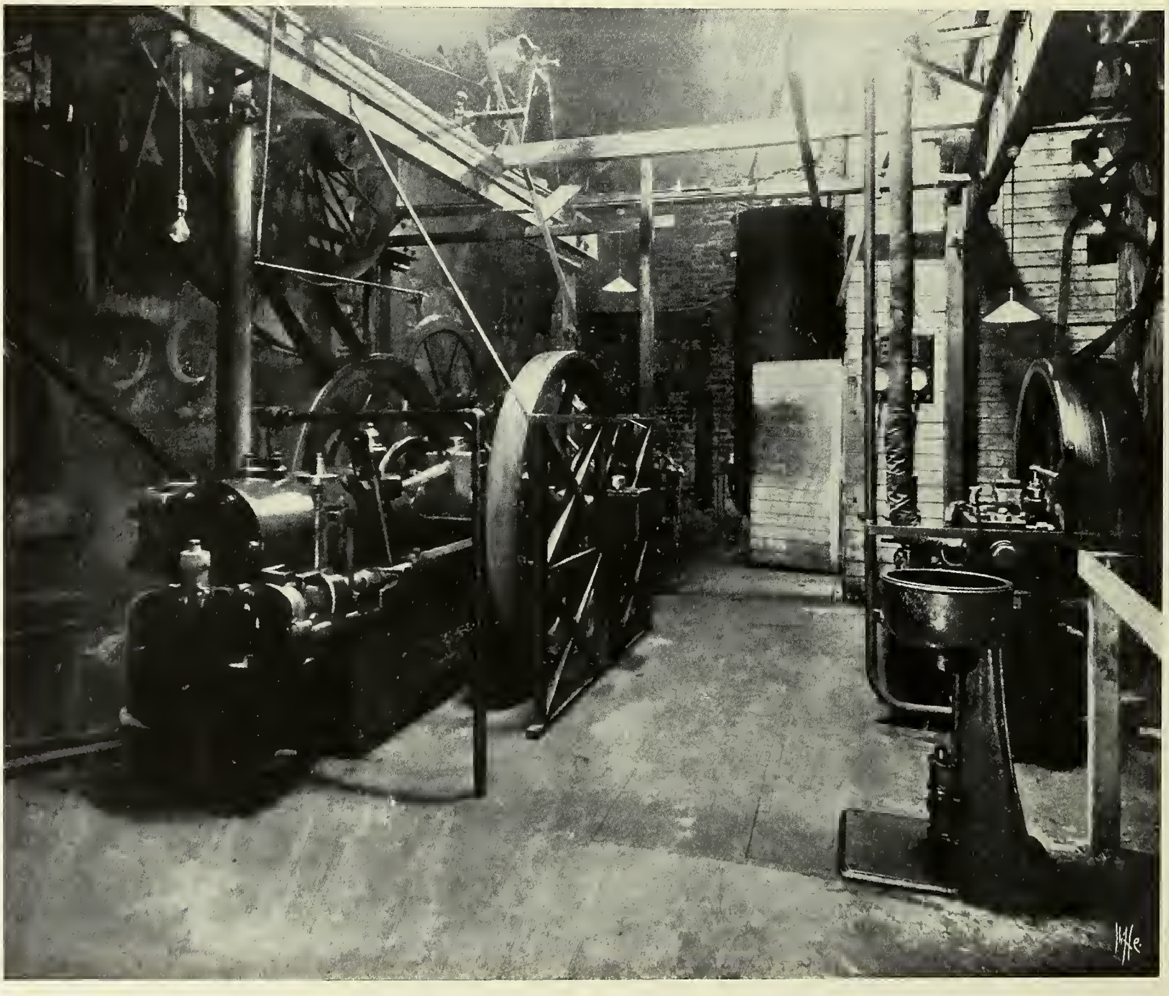
A butter factory receives its supplies of rough or "lump" butter from various sources. The first is, of course, the fair or market where small farmers bring their produce, and where they meet the buyers of the factory. There is also another source of supply in the smaller creameries. From whatever source, however, the butter may come, it is all in a crude state, unwashed and charged with butter-milk. It is the object of the butter factory to make this heterogeneous mass, uniform in appearance and texture, by blending it and removing all the butter-milk and other impurities. The butter is washed, blended, and made uniform and preserved.

No better example of how this is done could be obtained than the factory under review. Here is handled about sixty tons of butter per week on the average, and it will readily be conceived that this vast business requires many mechanical appliances for the various processes carried on.

All the plant is modern, and is constantly being added to, the most up-to-date appliances being readily adopted wherever merit is proved. It will rather surprise most people to learn that such a quantity of machinery, as we are about to describe, is necessary for the simple turning out of butter. The prevailing notion is that the butter is churned out of the milk, collected and dumped into firkins. We shall see that that is not so, however.

The refrigerating machinery is the main feature of the factory, and one of our illustrations shows a portion of this plant. It consists of a No. 9, or four tons (made) horizontal type patent carbonic anhydride machine, and the power for driving it is derived from a twenty N.H-P. gas engine. The same engine drives the factory as well. There is, however, duplicate power in the shape of a boiler and

steam engine, so that the risk of stoppage is minimised. The cold storage capacity is about 30,000 cubic feet, divided into three rooms, and the system of cooling is duplicated. There is sufficient cooling surface provided throughout by means of overhead nests of grids and brine walls surrounding the walls of the chambers. This surface is sufficient to deal with the heat eliminated. A safeguard, however, is provided consisting of a large cooler over which the total contents of the rooms can be passed by means of a circulating fan in a few minutes. One of the three rooms referred to is used for hardening the lump butter as it arrives from the country districts, so that it can be easily worked upon the tables. The butter working machines are five in number, three being of the horizontal rotating table type, and two of the vertical type. These latter are specially adapted for eliminating the butter-milk from the butter, and are considered much better for this purpose than the table machines. These are used for blending and mixing only, and it is upon them that the butter is made uniform in texture and appearance; the salt also being added there. Each table is also fitted with ploughs or inverters, which save an immense amount of hard labour. These ploughs are of very ingenious design, but are not easy to describe. They have the effect of turning the butter over in spiral fashion, and so causing it to be

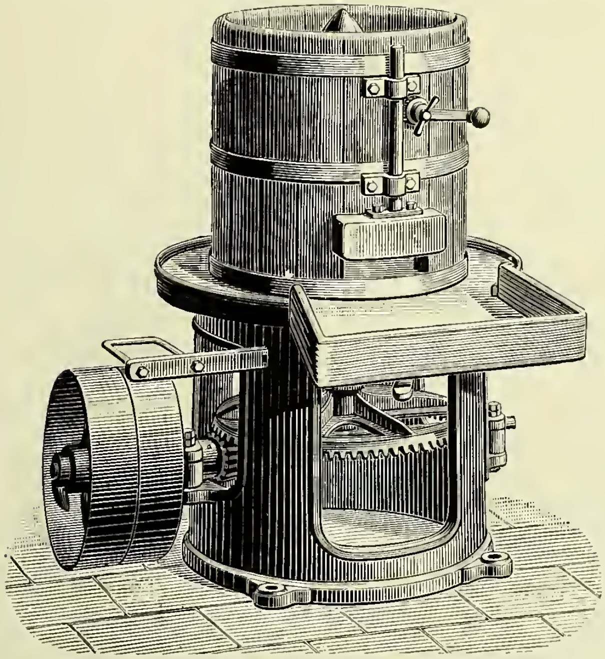


Engine Room, showing portion of the Refrigerating Machinery.

The same room also is used for hardening butter after it has been put in the firkins, if it is for immediate shipment. Tinned butter is also put in here after the butter has been packed into the tins, but before the covers of the tins are soldered on. This is a very important point, as the butter packed in these tins is sent all over the world, and has to be warranted to keep fresh three to four years. The other two rooms are used as stores for all the various packages of butter made.

The factory proper is a most interesting place. It is of course kept rigidly clean, and pure water is much in evidence. thoroughly mixed as it passes under the kneading rollers. The tin department is of very large dimensions, and the demands made upon it sometimes will be understood, seeing that the tinned butter, in packages varying from one to twenty-eight pounds, is constantly in demand for shipment all over the world; to such places, for example, as North and South Africa, all along the Mediterranean, Egypt, India, East and West Indies, South America, etc., etc. Only the other day a seafaring gentleman called at the offices of the firm, to say that he had seen an African chief wearing one of Messrs Shanahan's twenty-eight pound butter tins as a helmet.

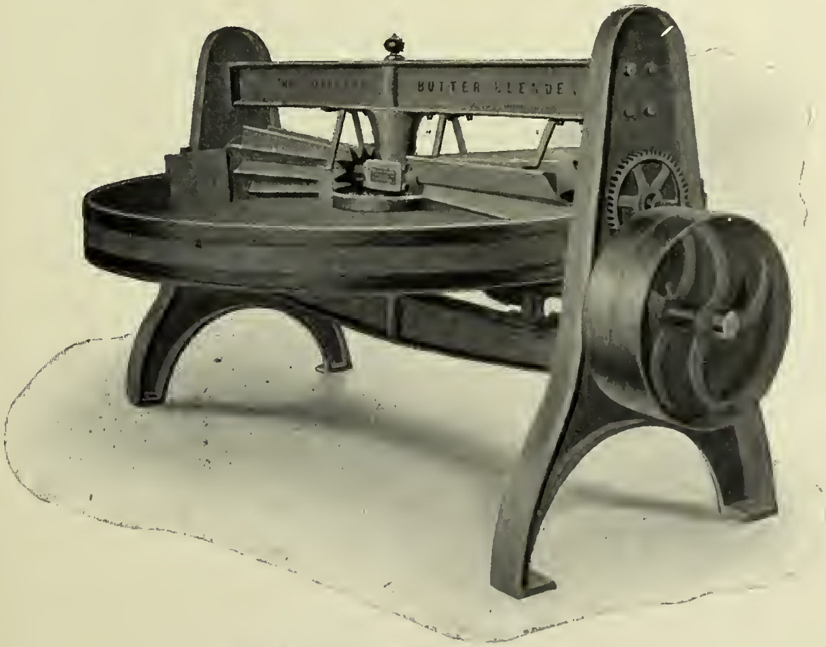
The engineers are putting in a large quantity of new power stamping and folding machinery, which will render this department very complete.



Vertical Butter Worker.

Throughout the factory there are many minor appliances, and no money is spared if any department can be improved or brought more up to date.

It is of interest to know that notwithstanding the immense competition from Scandinavia and the British Colonies, Irish, and more especially Cork, butter is more in demand than ever. The quantity shipped to England increases year by year.



Heavy Framed Butter Worker and Blender.

Butter Factories in Natal.—see Natal.

Butter Factories in South Australia.—see South Australia.

Butter Factories in Victoria.—see Victoria.

Butter Factories in Western Australia—see Western Australia.

Butter Imports.—see Dairy Produce Imports.

Butter in Cape of Good Hope.—see Cape of Good Hope

Butter in New Zealand.—see New Zealand.

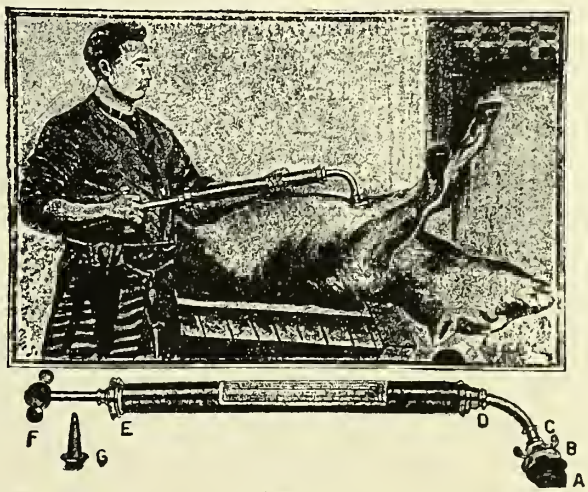
Butter in Nova Scotia.—see Nova Scotia.

Butter in Tasmania.—see Tasmania.

Butter Making, U.S.A.—see Dairy Products U.S.A.

Butter Trade (Irish)—see ships fitted for Irish Butter Trade

Butyrometer.—see Creamery Results.



Calf Blower.

CALF BLOWER.—The blowing up of veal and lamb is a pretty universal practice in England, and is performed sometimes by mouth and sometimes by means of mechanical blowers. Doubtless the mechanical blowers are very advantageous, as they prevent any contact of diseased human breath with the meat.

The apparatus figured is used for the purpose, and the directions for its use are as follows :—

Unscrew the pipe at D, then cut a slit in the calf's skin about one inch long and free it from the flesh, so as to get the steel plate marked A under the skin, then turn the plate the long way of the slit, and screw down the leather washer and brass clamp at B on the outside of the skin, so as to quite cover the hole, that no air can escape, fix again at D and proceed to pump, and in three minutes the calf will be blown. Take off the pump at D, leaving the pipe and nozzle hanging to the calf until it is opened. Be sure to cut the slit straight, and not too long.

Calf's Roll with Tongue.—Take out of a calf's breast all the ribs and bones, leaving the meat in one piece. Lay it in brine for two days, then take it out, dry with a cloth, then sew it up lengthwise, making one end into a point. Leave the other end open to be filled with the following mixture—chop some veal and fat pork very fine—say two of veal to one of pork. Season to taste with salt, pepper, and some ground ginger, and two or three very finely grated eschalots. Cut some salted and boiled pig's tongue into large dice, mix this through the chopped veal and pork thoroughly, then stuff the breast with this, making it very tight. Sew up the opening and roll up in a cloth, fastening it at both ends, and tie a string round it. Put into a pot and boil for an hour. After taking it out lay under a heavy weight till quite cold, when the weight may be removed and the cloth taken off.

Calves' Ham.—see Ham.

Cambridge Sausage.—

12 lbs. lean pork.
6 ,, fat pork or pure fat.
3 ,, scalded rice.
2 ,, sausage meal.
2 ozs. food preservative (dry antiseptic).
10 ,, seasoning.

Seasoning:—9 lbs. salt. ½ oz. cayenne pepper.
6 ,, white pepper. ½ lb. ground nutmeg.
½ ,, rubbed sage. ½ ,, ground mace.

Camwood or Barwood.—Formerly much used for dyeing the skins of poloney sausages a scarlet colour, but now largely superseded by the brighter aniline dyes. Camwood is sold as a powder or sort of sawdust, and all that is necessary for dyeing the sausage is to place a little of it in the boiling water, the quantity being proportioned to the depth of colour required. Camwood is a native of Angola, and its scientific name is *Bahia Nitida*. It belongs to the family of the *Leguminosæ*.

Canada.—The Dominion Government provides no agricultural statistics beyond those procured in connection with the decennial censuses. The following figures are from the censuses of 1881-1891:—Tables I. and II.

Cattle on Farms.—Table I.

Provinces.	Working Oxen.		Milch Cows.		Total Horned Cattle.		Increase or Decrease.
	1881.	1891.	1881.	1891.	1881.	1891.	
Ontario ...	23,263	12,424	782,243	876,167	1,702,167	1,940,673	+238,506
Quebec ...	49,237	45,676	490,997	549,454	949,333	969,312	+ 19,979
Nova Scotia ...	33,275	28,424	137,639	141,684	325,603	324,772	− 831
New Brunswick	8,812	7,510	103,965	106,649	212,560	204,692	− 7,868
Manitoba ...	12,269	19,199	20,355	82,712	60,281	230,696	+170,415
British Columbia	2,319	2,631	10,878	17,504	80,451	126,919	+ 46,468
P. E. Island ...	84	116	45,895	45,849	90,722	91,695	+ 973
The Territories	3,334	7,583	3,848	37,003	12,872	231,827	+218,955
Canada ...	132,593	123,563	1,595,800	1,857,112	3,433,989	4,120,586	+686,597

Sheep and Pigs.—Table II.

Provinces.	Sheep.		Increase or Decrease.	Pigs.		Increase or Decrease.
	1881.	1891.		1881.	1891.	
Ontario ...	1,359,178	1,021,769	−337,409	700,922	1,121,396	+420,474
Quebec ...	889,333	730,286	−159,547	329,199	369,608	+ 40,409
Nova Scotia ...	377,801	331,492	− 46,309	47,256	48,048	+ 792
New Brunswick	221,163	182,941	− 38,222	53,087	50,945	− 2,142
Manitoba ..	6,073	35,838	+ 29,765	17,358	54,177	+ 36,819
British Columbia	27,788	49,163	+ 21,375	16,841	30,764	+ 13,923
P. E. Island ...	166,496	147,372	− 19,124	40,181	42,629	+ 2,448
The Territories	346	64,920	+ 64,574	2,775	16,283	+ 13,508
Canada ...	3,048,678	2,563,781	−484,897	1,207,619	1,733,850	+526,231

Pork packing in the Dominion has been decidedly advancing in late years. The principal packing centres are Toronto, Montreal, Hamilton, Ingersoll, Collingwood, London, Peterborough, Ottawa, and Mitchell. From 1868 to 1877, bacon and hams were classed together, but since then they have been shewn separately, and an idea of the increase made in their exports may be obtained by studying table III. (page 117).

The principal markets for the Canadian produce are Great Britain and the United States of America, and the quantity of provisions taken by Great Britain for 1898 as per the import returns.—see Table IV. (page 117).

Cane Sugar.—Pure cane sugar is used for adding sweetness to the flavour of meats. Beetroot sugar is a dangerous article to use for this purpose, hence the term *Egyptian* sugar has come to generally describe what curers want. There is no special virtue in Egyptian sugar, the impression has been created that it is pure cane, that is all. Sweet pickles, pumping pickles, pickles for curing tongues, and in fact for all purposes, are improved by the addition of some cane sugar. It is a slight antiseptic in itself, but the primary object in adding it, is for its sweetness. The quantity generally used is about 2½ per cent.

Canning.—The art of preserving provisions in tins or cans is described as canning. The process is a very old one, dating back to 1810, when it was first made public by M. Appert, a Frenchman. Since that date the process has been adopted all over the world, and the trade for preserved provisions has reached gigantic dimensions.

There are several ways in which fruit, vegetables, meat, and foods of all kinds may be preserved.

1. By the use of cold or refrigeration.
2. By drying, or the use of heat sometimes termed "dessication."
3. By the use of preservatives.
4. By the exclusion of air.

It would be wrong to apply the term "canning" to mumber 4 as an equivalent meaning, inasmuch as there is much glass used in preserving fruits, vegetables, soups, and other special

Quantities of Meats of all kinds exported from Canada, during the years ending 30th June 1868-99.—Table III.

Year ended 30th June.	Exports, Produce of Canada.							
	Bacon.	Hams.	Pork.	Lard.	Beef.	Mutton.	Canned Meats.	Meats, other.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
1868	10,580,528		3,506,048	...	3,491,452			
1869	8,798,944		2,677,472	465,290	2,370,592			
1870	19,627,216		6,544,384	1,369,117	3,105,984			
1871	11,585,728		6,215,664	1,291,138	4,578,112			
1872	14,049,068		2,125,984	1,114,047	2,130,464			
1873	39,982,096		4,988,144	2,353,344	1,609,888			
1874	20,237,728		11,232,592	2,137,145	6,610,016			
1875	9,964,528		3,040,800	339,056	2,066,400			
1876	9,026,416		2,934,400	637,555	1,761,984	...	...	*503
1877	15,781,472		2,976,288	539,826	†5,420,800	...	...	1,478,570
1878	4,519,419	1,168,805	913,770	265,347	5,134,244	411,218	...	1,229,604
1879	3,977,276	669,878	498,290	312,443	2,050,672	300,915	...	712,039
1880	8,616,739	955,603	1,281,391	498,680	692,842	100,888	...	1,232,958
1881	9,785,089	569,598	1,578,168	209,679	1,372,809	173,798	...	1,109,167
1882	9,213,677	615,947	1,225,408	135,169	749,742	334,548	...	1,358,321
1883	3,736,724	517,636	806,843	51,203	628,728	397,280	...	1,803,370
1884	7,546,807	571,163	630,970	214,772	423,915	176,835	...	1,801,355
1885	7,189,260	962,827	555,436	63,559	542,209	330,376	257,593	373,092
1886	8,143,503	422,987	346,105	95,790	533,353	421,715	274,860	735,135
1887	11,030,689	395,253	617,135	159,248	450,706	415,403	480,115	894,504
1888	6,701,860	317,916	294,140	75,165	550,630	493,089	1,346,491	2,028,694
1889	3,879,782	186,900	284,697	92,002	449,158	119,285	366,407	1,068,812
1890	7,235,336	256,746	238,899	82,434	251,934	62,276	1,156,948	968,393
1891	7,150,756	403,481	67,687	47,734	309,791	291,991	2,767,080	160,795
1892	11,544,295	598,083	142,386	31,886	145,843	382,692	6,396,500	204,856
1893	17,288,311	1,216,036	903,022	709,624	356,106	89,957	10,115,625	422,704
1894	26,826,840	1,682,167	755,722	802,925	2,277,112	82,339	7,829,022	1,157,497
1895	37,526,058	2,607,968	519,736	1,276,586	5,673,592	112,316	3,470,446	1,454,663
1896	47,057,642	6,678,443	1,342,949	173,559	411,468	150,013	9,339,337	1,369,206
1897	59,546,050	9,582,402	771,798	228,203	1,660,220	201,515	4,848,894	4,522,959
1898	76,844,948	8,463,881	1,602,261	253,122	898,200	138,056	2,424,073	4,202,407
1899	111,868,938	4,783,989	2,154,846	1,656,004	363,810	139,882	1,110,165	897,560

* Kegs. † Including mutton.

Table IV.

Articles.		Total Imports.		Imported from Canada.	
		Quantity,	Value $.	Quantity.	Value $.
Cattle	No.	569,066	45,745,658	108,405	8,637,165
Sheep	,,	663,747	4,792,999	42,070	307,992
Swine	,,	450	4,964	...	...
Animals, other ...	$	...	244,175	...	...
Bacon	Lbs.	639,668,064	50,232,147	60,018,448	4,845,375
Hams	,,	220,897,488	18,954,883	13,151,936	1,135,257
Beef, salted ...	,,	23,401,840	1,328,619	172,144	11,096
,, fresh ...	,,	347,291,952	28,789,764	2,412,816	200,356
,, preserved otherwise than by salting	,,	31,510,528	4,951,736	1,052,240	116,576
Mutton, fresh ...	,,	371,168,112	23,857,271	...	...
,, preserved	,,	13,251,168	950,212	199,024	13,554
Pork, fresh ...	,,	62,451,424	5,671,516	1,128,400	91,080
,, salted ...	,,	30,911,216	1,556,253	1,977,808	92,651
Meats, all other	,,	66,108,672	6,825,252	1,331,120	138,004
Poultry and game	$	...	3,102,461	...	61,802
Butter	Lbs.	359,425,136	77,680,677	17,568,880	3,221,417
Cheese	,,	262,018,624	24,191,251	160,404,272	14,326,128
Lard	,,	235,969,552	14,053,965	5,035,072	332,398
Milk, condensed, etc.	,,	91,534,688	6,988,295	...	...
Margarine ...	,,	100,868,880	11,604,002	...	...
Eggs	Doz.	144,246,010	21,691,302	7,453,550	1,224,989
Honey	Lbs.	2,336,768	134,661	103,152	9,874

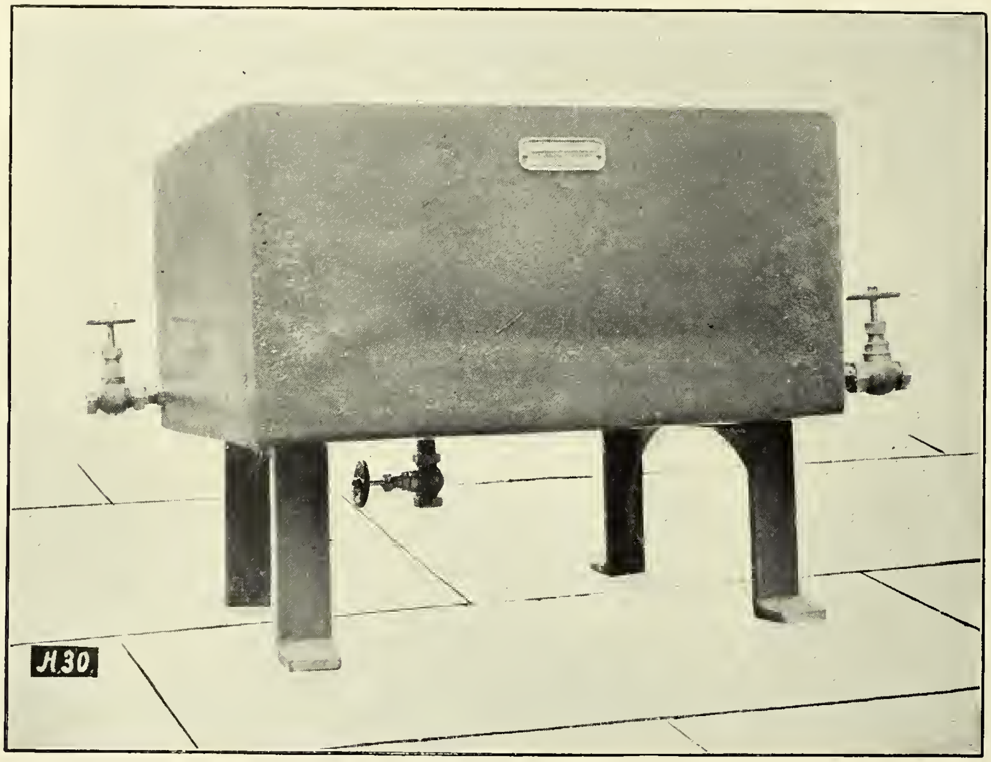
preparations. Canning proper is conducted by means of special applicances, these being specifically

a. A steam boiler.
b. Canning vats.
c. Retorts.
d. Soldering apparatus.

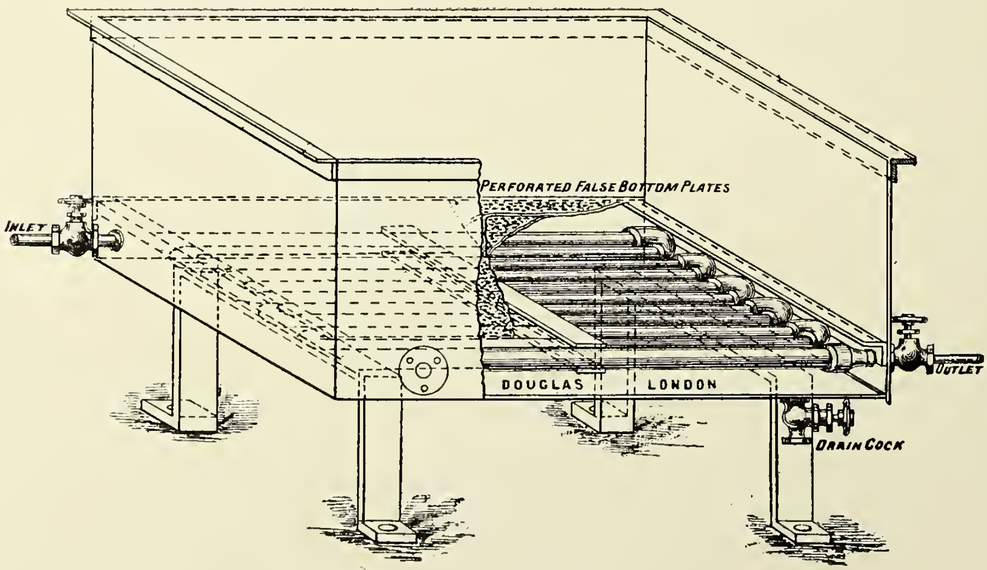
In many large factories there are also can making presses and tools in great variety. In an ordinary factory there is of necessity a steam boiler, so that it does not call for special notice here.

Canning Vats are pretty generally of the one shape. They are usually rectangular, although there is really no reason why they should not be circular. The construction is very simple. At the bottom of the vat is an endless coil of steam pipes. This coil is endless so far as the vat is concerned, there being no joints inside the vat itself. The coil where it enters and leaves is securely fastened by means of backnuts, and a stop-cock is placed also at both outlet and inlet. Another stop-cock is placed at the bottom of the vat so as to enable the liquid inside to be run out at will.

Over the steam coils are placed sections of perforated plate, so as to form a false bottom. It is upon these plates that the cans rest.



Canning Vat.



Sectional View of Canning Vat

There is no limit to the size of these vats, and the dimensions must altogether depend upon the quantity and nature of the goods to be handled.

When the vat is in use it is partially filled with a solution of calcium chloride and water, of sufficient density to indicate 100° on the Douglas salinometer. The depth of this solution in the vat depends entirely on the depth of the tins. The solution should reach about three-quarters up the sides. Where circular tins are used the sizes are as follows :—

1 lb. size	= $2\frac{3}{4}$	inches diameter	× 4	inches high.
2 ,,	= $3\frac{7}{16}$	,,	× $4\frac{9}{16}$	,,
3 ,,	= $4\frac{3}{16}$	,,	× $4\frac{7}{8}$	,,
10 ,,	= $6\frac{1}{4}$	,,	× 7	,,

The time required is about fifteen minutes and so on in increasing order according to the size. In order to prevent steam rising, always add some fat to the calcium chloride solution. It forms a film on the top and prevents any great evaporation. When the process is complete, the tins are fished out of the bath by tongs and plunged into cold water, then into dry sawdust, so as to clean them free from fat and moisture. Instead of fishing out the cans singly, a handy method is to have a crate to fit the bath, and when it is desired to remove the cans, let the whole crate be lifted by means of a crane.

In whichever way the tins are removed, they are then ready for lacquering and labelling. They should be stored in racks so as to be easily inspected. Unsound tins very soon show themselves by the bulging out of the lid. This is due to the expansion of the gases of decomposition, and tins which present this appearance should at once be destroyed. After the puncture hole has been closed, the cans may be removed from the bath and placed in a retort. (Some manufacturers use retorts alone and discard the bath, that, however, is undoubtedly wrong, as the air contents of tins are much more easily liberated in the bath).

The retort is on the same principle as the autoclave which is extensively used in French canning establishments. It has of late years almost entirely superseded the wet bath process for the higher temperatures. It is a single jacketed steam chest capable of working up to 50 lbs. steam pressure on the square inch; is rectangular in shape, and may be made to suit requirements. About 48″ × 48″ × 72″ deep is a fairly large size and can accomodate most goods. The cans to be heated are packed in trays and the wet steam turned on until the temperature reaches 270°. In some places the temperature is not allowed to reach a higher point than 240°, but according to our present knowledge this does not suffice to destroy the spores of bacteria.

As the process is simply one of heating; the length of time will depend largely on the sizes of the tins, and in these matters a little practical knowledge is very easily acquired.

With regard to the canning of such articles as vegetables, fruits, etc., these are all canned in the same way, but necessarily the length of time they are kept in the bath, and in the retort is very much less. Fish also require special treatment. In the treatment of vegetables, blanching vessels are necessary, and there are many special devices which become necessary where very extensive work is carried on.

The various goods that are tinned in large quantities are—

Beef.	Hams.
Mutton.	Bacon (in rashers for Army rations).
Brawn.	Fowl and all kinds of game.
Sausages.	A great variety of fish.
Pork pies.	Vegetables of all kinds.

The "process" as it is called is as follows :—

The article to be canned is placed in the tin usually after being cooked, and in the case of meat substances the spaces are filled up with jelly or fat according to the nature of the commodity. The lids are soldered on perfectly after noting that a puncture hole is free in the centre of each. The tin is then placed in the canning vat, being immersed to about three-quarters of its depth in the calcium chloride brine. The brine is now heated to 212°, and the tins are kept at that temperature until on wiping the puncture hole with a cloth, no more moisture or steam appears to be issuing. This should take about ten to fifteen minutes. Immediately thereafter, drop a little solder on the puncture hole of the lids, and so seal them up. Now increase the steam pressure until the temperature rises to about 270°. At this temperature the spores in the meat are destroyed. The length of time at which this temperature may be continued depends on the size of the tin. For a 1 lb. tin the time required is about ten minutes.

Table shewing the approximate times required to process certain goods.

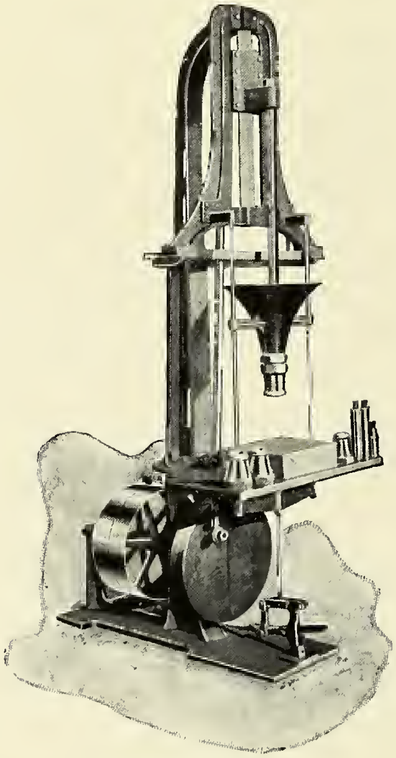
NAME OF GOODS.	Time required to discharge all air, temperature of bath being 212°	Time required to further cook in bath after closing puncture temperature of bath 212°	Time required in retort, temperature 240 Fahr.*
	Minutes.	Minutes.	Minutes.
Fruit.			
Apples	6	12	4
Apricots	6	10	4
Blackberries	5	10	4
Cherries	6	10	5
Currants	6	10	5
Gooseberries	6	10	5
Grapes	5	10	5
Nectarines	5	10	5
Peaches	5	10	5
Pears	5	10	6
Pine Apple	12	15	10
Plums	6	10	6
Raspberries	5	5	3
Strawberries	3	6	3
Whortleberries	5	10	5
Vegetables.			
Asparagus	10	...	35
Beans	10	...	40
Peas	12	...	25
Potatoes	5	15	6
Tomatoes	10	20	15
Fish.			
Crabs	10	...	10
Lobsters	10	...	20
Oysters	10	...	20
Sardines	...	...	15
Soups.			
Hare	5	...	20
Mock Turtle	5	...	15
All other Soups	5	...	20
Meats.			
Beef, Mutton, etc., according to size of can from	15	...	20
to	30	...	50
Sausages (put in tins uncooked)	30	...	20
Pork Pies (already cooked)	10	...	10

* The temperature stated is 240° Fahr. and this will be sufficient for most things, but it must be left to individual judgment when to increase this to 270° Fahr. so as to entirely destroy the spores.

Soldering apparatus in the large way is worked by power, but in the smaller way the apparatus consists of soldering irons and a gas stove.

Canning Vat.—see Canning.

Can Stuffing Machine.—A machine with adjustable hoppers and plungers for stuffing meat into cans. It is driven by power working on a counter-balanced eccentric. With this machine 300 cans of 2 lbs. each can be filled in an hour.



Can Stuffing Machine.

The meat is cooked in the boiling pans, then taken and put into the hopper or funnel made to fit each size of can, and each revolution of the machine forces the meat into the can. When the latter is filled it is weighed and sufficient added or taken out to make the exact weight, after which the tins are finished by the regular canning process.

This machine should work at 90 revolutions per minute.

Cape of Good Hope.—From the statistical register of the Colony for 1899, it appears that when the last enumeration of live stock was concluded, the following results were arrived at. In the whole Colony there were 1,077,044 cattle, 667,306 cows and heifers, 5,572,793 angora and other goats, 12,639,992 sheep, and 245,947 pigs. The produce yield was 2,769,719 lbs. of butter, 6,707,379 lbs. of mohair, and 35,179,900 lbs. of wool.

When the 1891 census was taken the following live stock was in the colony :—

Bulls - - - - - -	50,639
Milch cows - - - - -	581,978
Oxen - - - - -	610,866
Other cattle - - - - -	967,351
Sheep (woolled) - - -	13,631,011
Sheep (other than woolled) -	3,075,095
Goats (angora) - - -	3,184,018
Goats (other) - - - -	3,444,019

In Bechuanaland the same census gave :—

Cattle - - - - - -	48,686
Sheep (woolled) - - -	24,798
Other sheep - - - -	153,002
Goats (angora) - - -	15,048
Goats (other) - - - -	121,559

Compared with these the most recent figures are as follows, on 31st December 1898 :—

Merino sheep - - - -	10,843,443
Cape sheep - - - -	1,796,549
Angora goats - - -	3,014,937
Boer goats - - - -	2,557,856

The increase for the year in lambs and kids is stated at 4,394,644, while the losses through drought and disease were 1,498,173. These figures include East Griqualand, Tembuland and Transkei, Pondoland, Gordonia and Mafeking, but not Vryburg. The produce in addition to the figures mentioned at the beginning of this article, shows 5,504,100 lbs. of wool and 84,850 lbs. of butter from native territories.

The live stock returns show that at 31st May 1899, there were in the Colony :—

Bulls - - - - - -	47,630
Cows and heifers - - -	667,306
Oxen - - - - - -	362,108
Pigs - - - - - -	245,947

The imports into the Colony in 1899 were, for general provisions

From the United Kingdom,	31,454 lbs.	valued at	£1,458
„ New South Wales -	903,673 „	„	12,115
„ New Zealand - -	64,532 „	„	918
„ Queensland - -	102,260 „	„	1,566
„ Victoria - -	8,451,916 „	„	104,317
„ Other countries -	623 „	„	15
Preserved provisions from all sources,	5,971,686 lbs.	valued at	£160,589
Salted and cured provisions from all sources,	2,844,749 lbs.	valued at	£83,114
Cheese, - - -	2,552,599 „	„	67,181
Butter, - - -	2,675,901 „	„	120,720

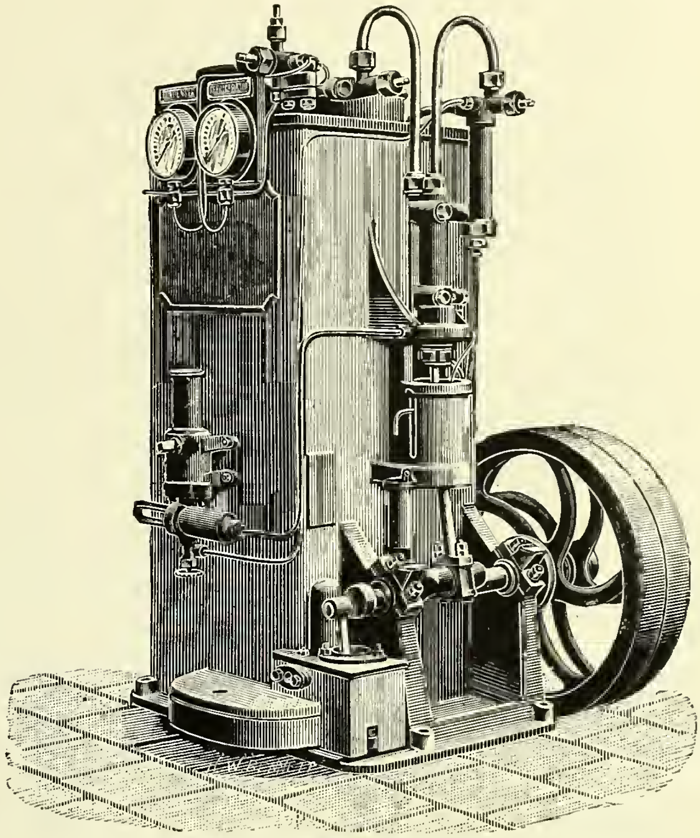
The bulk of provisions and butter imported into the Colony, came from Australia and the United States of America. The bulk of the cheese from Holland.

Capers.—The flower buds of a bush which grows in the south of France, those particularly from Provence being considered extra fine flavour. The youngest buds are the finest and sell dearest. They are sent to Great Britain in pickle.

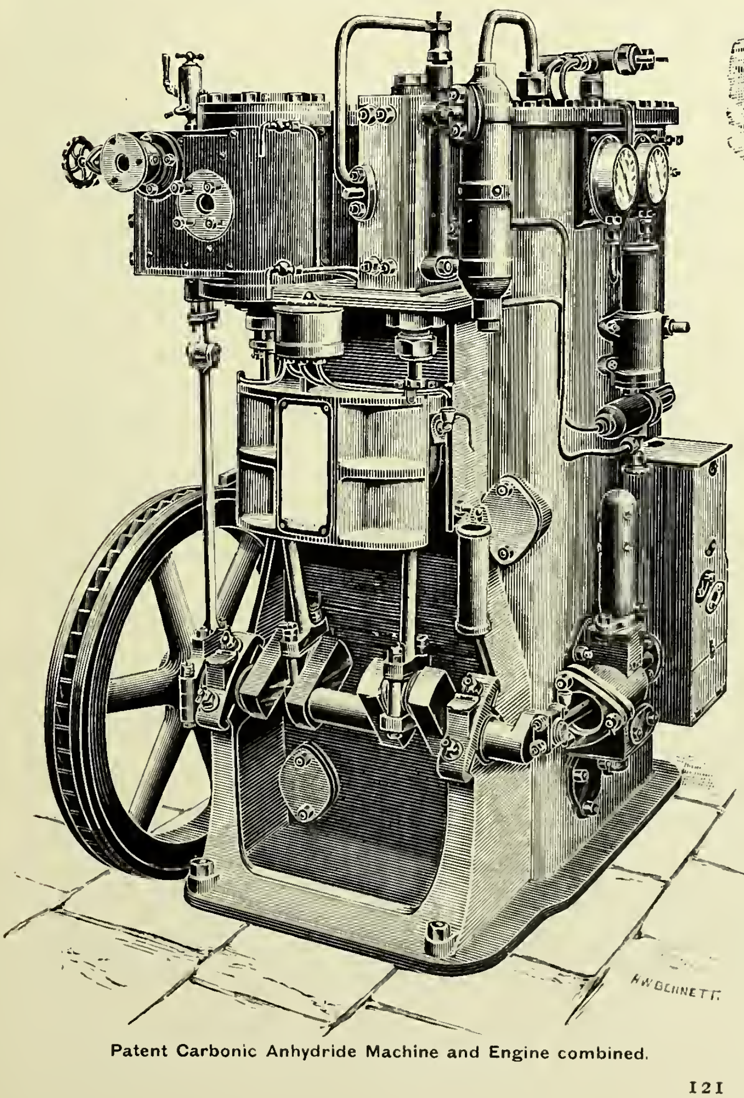
Caraways.—The seeds of the caraway plant which grow in Holland, and also in the eastern counties of England. The plants grow to about three feet in height, and bear small whitish or reddish flowers. The seeds, which form after the flowers, are remarkable for possessing elongated tubes or receptacles which contain the volatile oil from which the flavour comes.

Carbonic Anhydride Refrigerators.—Carbonic acid is the gas used in mineral waters. It condenses to a liquid under ordinary conditions at a pressure of about 700 lbs. per square inch; requiring this considerable pressure, it has a large corresponding refrigerating effect when it evaporates, therefore, a very small quantity is sufficient to produce a good refrigerating result.

The arrangement of these machines is as follows:—
There is an evaporator in which the liquid carbonic acid is contained in a coil of pipes, from which it evaporates rapidly by the aid of the compressor pump, and produces a strong refrigerating effect which is communicated to unfreezable brine surrounding the evaporator coil; this brine is composed of calcium chloride dissolved in water. The evaporated carbonic acid gas is pumped through the compressor into the condenser into another coil, and there, under the combined efforts of pressure from the compressor and cool water outside the coils, it is gradually condensed to a liquid, and flows back through a regulating valve into the bottom of the coils of the evaporator to be used over again. The process is thus continuous, and there is no waste except from leakage. One objection raised by some people to the use of carbonic acid is the high pressure required to liquefy it. This is entirely obviated by suitably made machines. The average pressure, as already stated, is 700 lbs. The whole of the working parts are tested to a working pressure of 3000 lbs. to the square inch. Besides, there is a safety valve composed of a small tested copper disc which bursts at a pressure of 1500 lbs. the square inch; and thus secures the absolute safety of the machine.

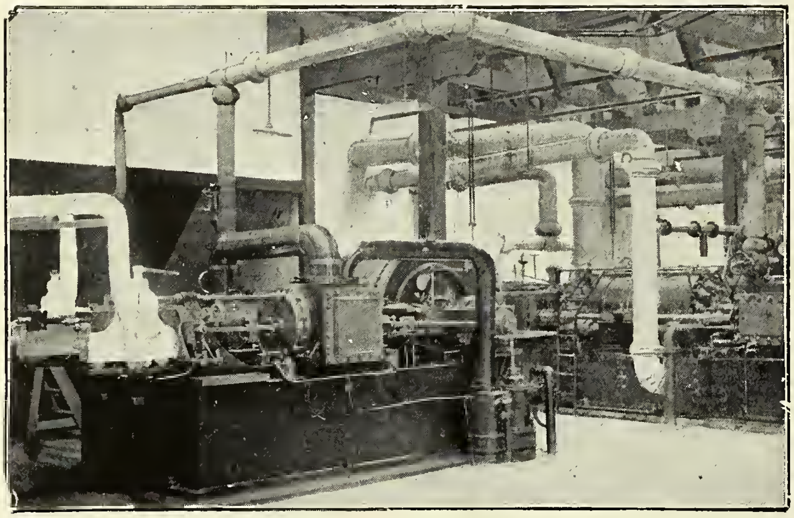


Patent Carbonic Anhydride Refrigerating Machine for connecting with existing power.



Patent Carbonic Anhydride Machine and Engine combined.

If we now go back to the evaporator, we find it is filled with unfreezable brine, which gradually loses temperature till it stands at from 10° to 15° Fahr. This brine may be used in various ways to affect the cooling of the storage chambers, or the making of ice. For the former purpose, it may be pumped through brine walls placed in the chambers, or it may be pumped through a series of pipe grids placed on the ceiling of room, or the brine may be pumped through a long series of pipes stacked up together in, what is called, an air cooler, and the air from the cold rooms can be drawn over these by a fan through air trunks, with slides to regulate the amount drawn from the different parts of the room, and this air passing over the stacks of coils is cooled and purified, and is then returned through the rooms through another set of air ducts with regulating slides. The rooms, by any of the above systems, can be kept at whatever temperature is



Patent Carbonic Anhydride Refrigerating Machine showing large capacity Installation for frozen meat trade.

required, down to about 16° Fahr. The advantage of the brine walls is that they hold a large stock of cold brine, and the cold from these is gradually given up during the night when the machine is not running, and so the temperature is kept steady. The refrigerating effect of the air cooler ceases the moment the machine stops, but this method has the great advantage of preventing deadness or dampness in the air. In all large installations a continuation of these methods is recommended, cooling the rooms so that there is the purifying effect of the air cooler, and the stock of "cold" in the brine walls, drums, or pipe grids.

With regard to the brine grids: There have recently been introduced galvanised steel cylinders (brine drums), 8 inches in diameter, which also contain a large stock of cold brine. It is the best modern practice to make both the brine system and the air cooler system sufficient in itself, to do the whole of the cooling required, so that in case of any break-down, one of the systems can, if necessary, be knocked off, and the work continued with the other.

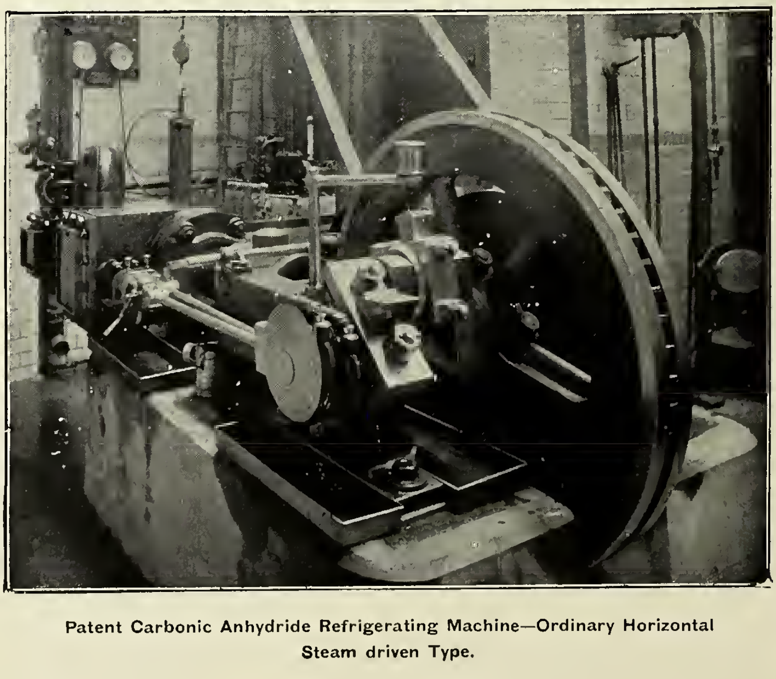
Cardamoms.—The capsules of a species of perennial plant much used in confectionery and for culinary flavouring. The plant is an abundant grower in the moist shady mountain forests of the Malabar Coast, where it is largely cultivated on small clearings. It is also grown in Ceylon and Java, and attains a height of from eight to ten feet. The three-celled capsules contain numerous wrinkled seeds which give an aromatic pungent flavour, and forms a spice a little weaker than pepper. Cardamoms are a favourite condiment in Asia and in North Germany. In Russia and Scandinavia they are used in nearly every household to flavour pastry, etc.

Cash Desk.—In a first-class shop it is always wise to have a cash desk or small office separate in the shop. It is convenient for one thing and makes a shop look very complete. As a store for books, papers, letters, bills, etc., its advantages are obvious. The form of these may vary according to taste (see illustration, page 123).

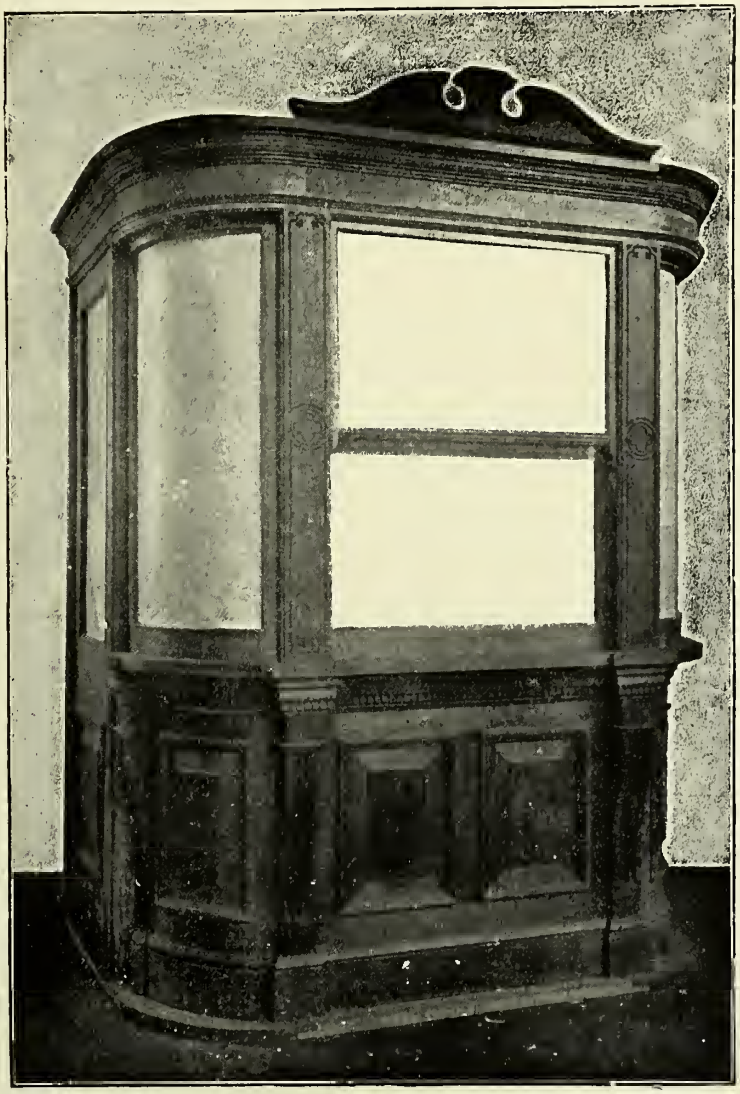
Casings.—A great deal could be written about casings, and the ins and outs of the trade. In the hands of reputable dealers, the business is all right, but otherwise it is open to fraud. If goods are well cleaned, from good stock, and cured with the proper amount of salt, they are generally worth the money that is asked for them, but when you come to take these same casings, repack and mix them with inferior goods, over-salt and over-weight them, you have casings that can be sold at cheap prices and show a better profit to the dealer than the right article. Casings can now be kept safely with a mild salting. Sheep casings are usually sold by the bunch or gallon of four bunches. Pig casings are usually sold by the lb.

See also "Sheep Casings," "Pig Casings," "Bungs," "Middles," "Guts," "Runners," and "Weasands."

Cassia or Cassia Lignea is the bark of the cassia tree, and is known in Europe as Chinese cinnamon. Cassia trees grow to a height of from fifty to sixty feet, and the bark is treated much in the same way as cinnamon. It is stripped off by running a knife along the branch on both sides, and then gradually loosening it. It is then allowed to lie for about twenty-fours, during which time it undergoes a kind of fermentation, and the epidermis is easily scraped off. The bark afterwards is dried, and assumes the quilted shape in which it is packed for export. Cassia Lignea is largely grown in China, India, and in fact in all the warm countries from India eastward, and is also found in the Phillipines and other places.



Patent Carbonic Anhydride Refrigerating Machine—Ordinary Horizontal Steam driven Type.



Mahogany Polished Cash Desk.

Cast Iron Pans.—Boiling pans made from castings instead of welded iron or steel. The castings are fitted together with bolts or screws.—see Boiling Pans, also Lard Rendering Pans.

Catcher for Pigs.—see Pig Catcher.

Cattle in Cape of Good Hope.—see Cape of Good Hope.

Cattle in Natal.—see Natal.

Cattle in New Zealand.—see New Zealand.

Cattle in Nova Scotia.—see Nova Scotia.

Cattle in South Australia.—see South Australia.

Cattle in Tasmania.—see Tasmania.

Cattle in United Kingdom.—see Live Stock Returns.

Cattle in Western Australia.—see Western Australia.

Cattle Marking Scissors are ordinary scissors with bent handles, for clipping the hair of animals at sales. Each buyer has his own private mark, and the cattle, etc., are easily recognisable even although they may get mixed with others after passing the sale ring.

Cattle Marking Scissors.

Cattle Weighing Machine.—see Weighing Machines.

Caviare.—The roe of the sturgeon salted. It is largely prepared in Russia, and is a favourite dish with epicures.

Cayenne.—Cayenne pepper consists of the dried fruit pods of one or two species of the capsicum plant. The pods are pulverised into a granular powder, and as a condiment it well upholds its generic botanical name. Capsicum is derived from "kapto," to bite. The plants are natives of South America, but are also cultivated in the East and West Indies, Western Africa, Zanzibar, and Natal.

Cayenne is a splendid stimulant to the stomach, and possesses great attractions to those who live in warm countries. A few of these shrubby plants may be often found in the ordinary tropical garden to supply the daily wants of the table; the chillies or contents of the capsicum pods being gathered and eaten just before becoming fully ripe.

Red pepper is a common name for cayenne, while the French call it by several names, "priment," "poivrons," "pevrots," and "corail of the gardens." The Spanish name for it is "agi."

There is an enormous consumption of chillies or cayenne in India, where it forms an important ingredient in curries and chutneys, but there it is ground into a paste between two stones, with a little mustard, lard, oil, ginger, and salt. It is the only seasoning used by the millions of poor in the East to flavour their otherwise insipid rice.

Celery Seed.—see Culinary Herbs.

Cellar Temperature.—see Temperatures for Bacon Curers.

Cervelatpolse, or Danish Beef and Pork Sausage.—see Bacon Curing in Denmark.

Cervelat Sausage.—see Summer Sausage, Pork Cervelat, and Beef Cervelat.

Chain Hook.—see Hooks.

Chaps.—see Pig's Heads.

Cheese Imports.—see Dairy Produce Imports.

Cheese in Canada.—see Canada.

Cheese in Cape of Good Hope.—see Cape of Good Hope.

Cheese in New Zealand.—see New Zealand.

Cheese in Nova Scotia.—see Nova Scotia.

Cheese in Queensland.—see Queensland.

Cheese in South Australia.—see South Australia.

Cheese in Tasmania.—see Tasmania.

Cheese in Victoria.—see Victoria (Australia).

Cheese Making, U.S.A.—see Dairy Products, U.S.A.

Cheesemongers' Benevolent Society.—The object of the institution is to relieve, by the means of pensions, incapacitated master cheesemongers, provision merchants, agents and brokers, cheese factors, butter and egg salesmen, bacon dryers, and lard refiners, or their necessitous widows.

Pensioners who have been subscribers to the institution for five years and upwards receive each, men £32, women £24 per annum; those who have not been subscribers for such period, men £26, women £20 per annum; and upon the decease of a male pensioner, leaving a widow unprovided for, the committee may place her upon the funds of the institution *without election*. An *annual* subscription of a guinea, or a donation or life subscription of ten guineas, entitles the subscriber to as many votes as there are pensioners to be elected. An *annual* subscription of half-a-guinea, or a donation or life subscription of five guineas given by a lady, entitles her to an equal number of votes; double the amount of such subscription to double the number of votes, and so on in proportion. Offices: 14 Wellington Chambers, London Bridge, S.E. Secretary, Mr Edgar Kent.

Chemistry of the Pig.*—In general composition, the bodies of all animals exhibit comparatively little difference. Built up on a skeleton frame-work of bone are the several tissues constituting the various organs and determining the contour of the body. The matter thus supported we say consists principally of adipose tissue and muscular tissue, or fat and flesh, and these, together with the bones connected by cartilage, membranes and tendons, surround and support the several vital organs. But in the economy of food production, in the commerce of food supply, we are concerned only with the principal constituents, and to these it is my purpose to confine myself in the consideration of the subject set for treatment.

In the animal body the adipose tissue, or the fatty tissue, is, as a rule, distributed between the muscular tissue and the skin, and within the abdominal cavity around the internal organs. Sometimes it is distributed through the muscular tissue as well, but, with comparatively few exceptions, to only a very limited extent. As found immediately underneath the skin, and within the abdominal cavity, it consists of masses of cells, containing globules of fat, each of which is in turn inclosed within an exceedingly thin enveloping membrane. Underneath the skin, in most of the fat animals, it is distributed through the areolar tissue, so that in the hog, the latter, in the external layer of fat, is apparently obliterated. The fat cells, themselves, have a diameter of from one-eight hundredths to one-three hundredths of an inch, and are surrounded by a membrane, the thickness of which is estimated to be not more than one-twenty-five thousandths of an inch. The fat contained within these globules consists of compounds of glycerine and the fatty acids, known as oleine and stearine, with varying proportions of palmatin, according to the species of animal under consideration. In the fat of the hog the oleine predominates, and occurs, as a rule, in the proportion of about 65 per cent., the remainder consisting of about equal parts of stearine and palmatin, by the older authorities classed as margarine.

Muscular tissue, or the lean meat of animals, is made up of two distinct groups; first, that of the voluntary muscles, which are contracted entirely by the will of the animal; and second, that of the involuntary muscles, whose functions may and do operate without the intervention of will power, as in the heart. The flesh known as the striated muscular tissue, the voluntary muscles, is that in which we are the most interested in the consideration of food supply. According to Kingzett (Animal Chemistry, p. 326), it consists of about 75 or 80 per cent. of water, and 15 or 17 per cent. of certain albuminous principles, while the remainder is made up of so-called extractive matter or salts. Kuhne distinguishes two important divisions in muscular tissue, and calls them *muscle clot* and *muscle serum* respectively. When muscle in a fresh state and freed from any adherent blood is frozen and thoroughly pulverised, and the pulverised mass mixed with four times its volume of snow containing one per cent. of sodium chloride (common salt), and the whole further pulverised, it will eventually become liquid, and at 30 degrees F. will pass through linen, while at zero it may be passed through filter paper. The opalescent liquid obtained when exposed at ordinary temperatures will quickly coagulate into a firm mass, which on standing will contract like the clot of blood, with a tendency to separate into flakes, leaving an opalescent liquid surrounding it. So Kuhne calls the original mass *muscle plasma*, and the separated masses *muscle clot* and *muscle serum*, respectively.

The mucle clot consists of myosin. In the muscles of freshly killed animals it is in the semi-fluid condition common to all flesh. The muscle at this time is alkaline in its reaction, but in a short time it becomes acid. This myosin now sets or coagulates, and causes the hardening or stiffening of the muscles, commonly called *rigor mortis*. It is soluble in a 10 per cent. solution of sodium chloride, and in neutral salts of all degrees of concentration; exceedingly soluble in dilute alkalies and acids, but can not be separated from solutions in the latter, unchanged.

According to Kuhne, the muscle serum consists of at least three forms of albumen:—

1. Albumen coagulating at 30 degrees C. (86 F.) when abundance of acid is present. Probably a mixture of potassium albuminate and sodium phosphate.

2. Albumen coagulating at 45 degrees C. (113 degrees F.)

3. A large quantity of albumen coagulating at 75 degrees C. (167 degrees F.)

There are other matters still in small quantities coagulating at 90 degrees C. (195 degrees F.) The rigor mortis is undoubtedly due in part to the coagulation of some of these albuminoids by the acids developed in the muscle after death. But Du Bois Reymond believes that there is no relation between the acidity of the muscles and the rigor mortis. This acid reaction is due principally to paralactic acid, though other acids are present, such as inosinic, butyric, acetic, and formic. Other bodies are also present in small quantities, but in the dietetic relations of flesh they are of

*These papers were published some years ago by Professor M'Murtrie, of the Illinois Industrial University, and were made available only to those receiving a copy of the Report of that Institution. The importance of the data arrived at, warrants a far wider audience, as the figures have not been much added to since.

little importance as compared with the constituents already mentioned, and for our present purpose may be disregarded. They appear in the following table given by Hoffman, showing the composition of the flesh of mammals:—

Solid constituents in 1000 parts	217–255
Water in 1000 parts	745·783
Organic matters in 1000 parts	208–245
Inorganic matters in 1000 parts	9–10
Coagulated albumen, sarcolemma, neudei, vessels, etc.	145–167
Alkaline Albuminate	28·5–30·1
Creatinine	2·0
Xanthine and hypoxathine	0·2
Taurine (peculiar to the horse)	0·7
Inosit	0·03
Glycogen	4·1–5·0
Lactic acid	0·4–0·7
Phosphoric acid	3·4–3·8
Potash	3·0–3·9
Soda	0·4–0·43
Lime	0·16–0·18
Magnesia	0·4–0·41
Sodium Chloride	0·04–0·1
Oxide of Iron	0·03–0·1

The coagulated albumen and alkaline albuminates, therefore constitute the greater portion of the organic matters of flesh, and correspond with the muscle plasma of Kuhne and syntonin of Liebig and the earlier investigators of the composition of flesh. The extent to which they differ from the albumen of egg and blood has already been shown, and in a certain sense is familiar to every one. But we see that about 75 per cent. of these solids have a nutritive value quite equivalent to that of the solids of eggs.

In nutritive value the bones occupy a very inferior position, and need scarcely be considered in such connection. Consisting of 12 per cent. water, 58 per cent. mineral matter, and 30 per cent. of organic matter, they offer more of interest because of their mineral than their organic elements. The latter consists, principally, of a nitrogenous substance known as osseine or collagen, which, though insoluble in cold water, becomes changed by the action of hot water and dissolves as gelatine or glue, and this, though much inferior to albuminous principles in nutritive value, is nevertheless considered worthy of treatment by the best authorities in the works on foods. It is of course consumed in large quantities. In the bones it is associated with more or less fat, which is distributed throughout the tissues of the spongy parts or in the marrow of the cavities. Dr Edward Smith (Foods) considers that the nutritive value of bones, because of these constituents, is equivalent to about one-third their weight of flesh, as regards carbon, and one-seventh their weight as regards nitrogen, and that because of the relative prices of bone and flesh, the former adds to the economy of a diet. They should not, therefore, be wholly disregarded in the calculation of the values of animal products. The albuminoid substances of the animal body differ from the fatty substances in that the former contain 16 to 17·5 per cent. of nitrogen, and they are generally classed as proteine. We shall thus designate them in our further remarks. The fats, on the other hand, contain no nitrogen.

With these preliminary considerations concerning the general constituents common to all animals, we may proceed with the presentation of the facts concerning the composition of the hog in particular. The hog differs from most animals in its tendency to store up fat, and it is in this connection that it is most familiarly known. This relation is nicely illustrated in the figures obtained by Lawes and Gilbert, of Rothamstead, England, in the analyses of the different parts of the carcases of farm animals which have become classic. The following is a general statement (Warrington Chemistry of the Farm, p. 63) of these results, after making deductions for the contents of the stomach and intestines:—

Constituents.	Fat Calf.	Half Fat Ox.	Fat Ox.	Store Sheep.	Fat Sheep.	Extra Fat Sheep.	Store Pig.	Fat Pig.
Water	61·5	56·0	48·4	61·0	46·1	37·1	58·1	43·0
Nitrogen, matter	15·7	18·1	15·4	15.8	15·8	11·5	14·5	11·4
Fat	15·3	20·8	32·0	19·0	19·9	48·3	24·6	43·9
Ash	3·9	5·1	4·2	3·3	3·3	3·1	2·8	1·7

With the exception of the extra fat sheep we find that the proportion of fat in the fat pig is higher than in any of the other animals presented. According to Sanson, pigs should lose only about 15 per cent. of the live weight in slaughtering. That is, the net dead weight should be 85 per cent. of the live weight. According to this authority the relation between parts should be as follows:—

(*La Livre de la Ferme.*)

Blood	3·2	percentage of live weight.
Stomach and intestines	4·0	,, ,,
Liver, lungs, tongue and heart	3·2	,, ,,
Fat of intestines and kidneys	9·0	,, ,,
Contents of stomach and intestines	1·8	,, ,,
Carcase	76·6	,, ,,
Loss	4·0	,, ,,

These figures are supposed to represent pigs in average condition of fattening. For English pigs Lawes and Gilbert found the following relations:—

Offal parts	16·87 per cent.
Carcase	82·57 ,,
Loss (evaporation, etc.)	0·56 ,,

This is for an average of 59 pigs having a weight of 212 pounds. (Harris on the Pig, p. 91).

Wolff gives the following on the average composition of well fed and fattened pigs (Armsby's Manual of Cattle Feeding):—

Constituents.	Well Fed.	Fat.
Blood	7·3	3·0
Entrails and contents	16·8	11·0
Flesh and fat carcase, or for the carcase	74·5	84·6
Flesh without fat and bone	46·4	40·0
Bones	8·0	5·8
Fat in flesh	16·5	32·4
Fat on Kidneys	1·9	3·9
Fat on omentum and intestines	1·7	2·5

Referring to the live animal, he gives the following figures for the percentage composition:—

Fat	40·2
Proteine	11·0
Ash	1·8
Water	42·0
Contents of stomach and intestines	5·0

Now all the figures I have given are those abroad, and with animals of European production. They are of value to American breeders and pork producers, but will scarcely be of the same interest as similar figures for American-grown pork. I have, therefore, taken some pains to secure such data, and by interviews and correspondence with some of the packers of Chicago, have been successful in obtaining the

results of experiments in killing, that show nicely the relations of the parts in the American product also. I have received the following from Mr John C. Hately, of Chicago:—

I.

"I am sorry I can give you so little information of value to you in preparing your paper on "The Chemistry of the Pig." If the time at your disposal had been greater, I should have had much pleasure preparing a few tests for your guidance. The following may be of some service to you:—

	per cent.
Offal, hearts, livers, bones, entrails, except the small and bung gut, are made into dried fertilizer, containing about 7 per cent. of ammonia, worth just now 3 cents per unit or $21 per ton	2·25
Blood made into fertilizer containing 15 per cent. of ammonia, worth just now 3 cents per unit or $45 per ton	0·75
Small guts used for sausage casings and worth now 30 cents per pound	0·12
Bung guts do., worth 20 cents per pound	0·10
Fat (lard, gut fat, and greese)	15·15
Flesh (sides, hams, and shoulders)	57·00
Lean meat, trimmings, tenderloins, hocks, etc., all taken from the sides, hams, and shoulders in cutting them into shape necessary to offer for sale on the market	3·50
Tongues 6 cents per pound	0·35

Of hair and bristles I have no data for the per cent. of weight. They are sold by packers, at so much a hog, to hair manufacturers. This summer the price averaged 2½ cents per hog. Last winter 10½ cents. The reason for this difference is, winter hogs yield more and stronger bristles and longer than summer ones."

I have received the following from Messrs George D. Baldwin & Co.:—

II.

"The yield of the several parts of the hog depends not only upon the weight, but upon many other things, as the breed, the feed, the health, the age, etc. It does not appear that winter or summer feeding makes any difference in the yield. There never was less waste in hogs slaughtered in Chicago than during the last four weeks. It is generally true that hogs yield more in winter than in summer, but this appears to be due not to the temperature but to the feed, the amount and quality given.

The distance from which hogs are brought to be slaughtered also affects the yield, other conditions being the same—the greater the distance the greater the percentage of yield.

For the American markets, hog sides are cut in Chicago, for the most part into what are called short ribs or mess pork, and when so cut the yield is about as follows:—

	per cent.		per cent.
Shoulder	10	Shoulder	10
Ham	11	Ham	11
Lard (rendered)	15	Lard (rendered)	15
Short Rib	39	Mess pork	40·5
	75·0		76·5

In addition to the above the following product is secured:—

Tenderloin about	1 pound per hog.
Tongue ,,	1 ,, ,,
Lean trimmings	1½ ,, ,,
Heart	0·25 per cent. of live weight.
Feet	1·56 ,, ,,
Cheeks removed from bone	0·20 ,, ,,

The foregoing figures are taken from actual tests made last winter of two lots of hogs weighing alive about 290 lbs. of the best quality. We have no tests showing the weight of all the bones, nor the proportion of lean and fat meat.

From 4811 hogs cut in 1880, having an average weight of 215 lbs., there were made 6007 pounds of dried blood containing 16 per cent. of moisture; 42,227 pounds of pressed tankage containing 42 per cent. of moisture.

When the shoulders and hams are cut off and trimmed and a butcher's loin made from the side, the loin will make about 9 per cent. of the hog. If the rest of the lard and the fat trimmings be rendered, there will be a yield of lard of about 40 per cent. of the live weight. These figures are taken from a test made recently of 100 hogs weighing 340 pounds."

Both of these letters are full of information and suggestions and it is to be regretted that those having the facilities for this purpose, do not make further tests in this direction, with animals of different breeds and known history as regards all conditions of feeding, management, health, etc.

During the limited time allotted me for the preparation of this paper, I have myself endeavoured to supply the deficit of information concerning the average composition of American hogs here illustrated. We see that in Germany, France, and England, careful tests have been made in slaughtering to determine the relation between the several parts of the animal, while at the same time chemical analyses have been made of these parts; but we may search the records in vain for anything of like character in this country. I have, therefore, undertaken the slaughter of two animals of good average condition, with the separation of the several parts. The short time remaining in which to make such an experiment, and the haste this involved, prevented that nicety of arrangement and extended detail of preparation, that is so desirable in work of the character we have prosecuted in this direction. But we hope the results we have obtained and have to present will not be without interest, and will serve to open the way for further work in the same direction.

In carrying out our purpose we secured two hogs of good average condition, and caused them to be slaughtered. The animals chosen for the experiment were of the Poland-China and Berkshire breeds respectively, and were both females. It was our desire to secure not only of the same breed and sex, but those of the same age similarly fed; but in this particular, as our figures show, we were disappointed. It seemed impossible to secure animals of exactly the same age, but both had been corn fed, and it is therefore to be presumed they had all they could eat and digest. One of the animals, the Poland-China, had been fasted previous to slaughtering, and the other lately fed, but it is believed this could affect only the entrails. They were slaughtered in the afternoon, and all the parts of offal collected as completely as possible. Each part was weighed and the weight recorded. The carcase was then divided into two parts, in the direction of its length, and allowed to cool over night. On the following morning one side was carefully skinned, the fat separated as completely as possible from the flesh, and both from the bones, and all weighed separately. Each part was then chopped into small pieces, and samples taken from each lot for analyses.

The results of slaughtering are as follows:—

Constituents.	Poland China. Age, 11 months. Live wt., 340 lbs.		Berkshire. Age, 9 months. Live wt., 245 lbs.	
	Actual weights. Pounds.	Per cent. live weight.	Actual weights. Pounds.	Per cent. live weight.
Blood	11·50	3·38	6·00	2·44
Hair, etc.	2·25	0·66	1·50	0·61
Entrails and contents	17·25	5·07	15·00	6·11
Liver, kidneys, spleen, brain	5·75	1·07	4·75	1·95
Heart, liver, tongue	6·00	1·91	6·00	2·44
Flesh without fat and bones	101·00	29·70	80·00	32·61
Bones (crude)	21·50	6·30	17·50	6·73
Side fat	104·50	30·73	70·00	28·57
Kidney fat	12·00	3·57	8·00	3·26
Fat on entrails	5·00	1·47	3·50	1·43
Skin	17·00	5·06	12·00	4·88
Loss	35·00	10·29	21·75	8·87
Total	338·75	99·21	246·00	99·90

We see by this table that the animals differ in age, and on this account perhaps in weight also. In the percentage figures we find some important differences for the same parts. Thus we find that the Poland-China has nearly one per cent. more of blood than the Berkshire, while as regards the internal organs, those of the Berkshire are 3 per cent. heavier than those of the Poland, when referred to total weight of carcase in each case respectively. In the latter, however, the percentage of flesh is lower, and that of fat higher in every part. We have a loss in both cases that can not be accounted for, of 10·29 per cent. in one case, and 8·87 per cent. in the other.

The differences here appear to be in favour of the Poland breed, and these conditions are further supported by the chemical analyses.

In preparing for the latter the several parts were reduced to small pieces and thoroughly mixed. From each lot a sample, sufficiently large to fill a can of one quart capacity, was taken, enclosed in the can, and the latter labeled to indicate the source of the material. From these cans the samples for analyses were drawn. The contents of each can were very thoroughly mixed, about fifty grammes separated and reduced to a finely divided condition, and the quantities needed in each operation of the analysis taken from the material thus prepared.

For the estimation of moisture and oil, from 0·7 to 1·5 grammes was taken from each sample, placed within the tube of the continuous extraction apparatus, and dried with suitable precautions. The loss of weight by evaporation at 110 degrees C. (238 degrees F.) was reckoned as moisture. The residue, from determination of moisture with ether in a continuous extraction apparatus, until completely exhausted of fat. The ether solution of the latter evaporated in a small flask, and the residual of fat weighed.

Ash was determined by carefully incinerating 50 to 100 grammes of the well-mixed material in a weighed platinum dish, and the residual mineral matter weighed. Proteine in this case was estimated by difference, because of the difficulty experienced in securing accurate and satisfactory results by the combustion process.

The results obtained in these analyses, expressed in percentage of each part, are given in the following table :—

Analyses of different parts of Hogs' Carcases.

BREED—Constituents.	Moisture	Fat.	Ash.	Proteine
Poland.				
1. Gut fat - - - - -	9·63	88·39	1·91	2·937
2. Side fat - - - - -	5·00	92·33	0·0015	2·668
3. Kidney or leaf fat - -	4·1:8	93·336	0·0666	1·25
4. Flesh or Lean Meat -	60·53	13·505	1·232	24·733
5. Bones (crude) - -	38·655	21·1706	24·808	16·3644
10. Skin - - - - -	53·32	3·742	0·344	42·594
Berkshire.				
6. Gut fat - - - - -	19·35	78·61	0·0023	2·04
7. Side fat - - - - -	8·13	95·846	0·0428	0·9812
8. Kidney fat - - - -	1·73	96·425	0·0445	2·8005
9. Flesh - - - - -	67·30	15·584	0·779	16·837
11. Bones (crude) - -	40·944	20·883	27·136	10·997
12. Skin - - - - -	49·380	4·625	0·640	45·715

It must be observed that in the separation of the fat and lean meat more care was taken to prevent leaving meat with the fat, than leaving fat with the meat. The proportion of fat in the flesh is therefore considerably higher in this case, than obtains in flesh free from large particles of fat. And the same is true of the bones, for while they are separated from the flesh as completely as possible, yet a comparatively high proportion of flesh and fat adhered to them, and so modified the proportions of the constituents shown in our analyses. In the calculation of the proximate composition of the carcase, however, these figures are, we believe, all that are desired.

If from these figures, and those of the preceding table giving the relation of the parts, we make reductions of percentage of moisture, fat, ash, and proteine, we have the following results for the dressed carcase :—

Poland China Pig

Constituents.	Total per cent.	Water.	Fat.	Ash.	Proteine
Flesh - - - -	39·453	23·9859	5·32	0·0577	9·728
Bones - - - -	8·398	3·151	1·778	2·8832	1·439
Side fat - - -	40·820	2·041	37·689	0·0061	1·089
Kidney fat - -	4·690	0·193	4·518	0·003	0·0058
Skin - - - -	6·640	3·540	0·248	0·0228	2 8282
Total - -	100·001	32·9109	49·553	2·9728	15·0900

Berkshire Pig.

Constituents.	Total per cent.	Water.	Fat.	Ash.	Proteine
Flesh - - - -	42·666	27·714	6·639	0·3323	7·183
Bones - - - -	9·333	3·882	1·949	2·5226	1·026
Side fat - - -	37·333	3·035	33·915	0·0159	0·367
Kidney fat - -	4·266	0·6738	4·070	0·0018	0·119
Skin - - - -	6·400	3·1603	0·296	0·0409	3·325
Total - -	99·998	38·4651	46·869	2·9135	12·020

We have here the means for comparing not only these two animals as regards their composition, but through the intervention of published analyses, with foreign animals as well. In the Berkshire, which had the lowest live weight and was two months younger than the Poland China, we find a higher percentage of flesh and a generally lower proportion of side and other fat. We find also that the proportion of water is higher and the total of pure fat lower, as might very naturally be expected, perhaps. But it is interesting to note that in the animal in which the proportion of flesh ranged higher than in the other, the proteine substances are considerably lower, and this is an important point in the determination of the nutritive value of the product. We find it lower, not only in the carcase as a whole, but in both the flesh and side fat as well, the two parts used in the crude condition for immediate consumption.

In the skin the proteine is higher, but this is probably only an evidence of the fact that the fat was more completely removed in one case than in the other, yet the higher fat and higher proteine both occur on the same side.

If then we have our standard of composition upon the relative percentage of proteine, it appears that the Poland pig is of decidedly greater value for food supply, while the same is true if we base our estimate upon the proportion of fat. What changes the Berkshire might undergo in an additional

two months of growth, feeding and fattening, we have no means of knowing, and it would be manifestly unfair to base definite comparison of the breeds upon these figures. Further analyses are necessary to confirm or deny the relations here set forth.

But it would seem doubtful if this animal could have gained the additional 100 in live weight during the period named, or change the proportion of proteine from 2 to 15 per cent. Yet it is possible.

We may now compare these figures for Illinois hogs with those of a similar character obtained in analyses of hogs of England and Germany. For the former we are indebted to Lawes and Gilbert, and for the latter to Dr Wolff.

Constituents.	English. Lawes & Gilbert.		German. Wolff.		American. M'Murtrie.	
	Store Pig.	Fat Pig.	Well Fed.	Fat.	Poland.	Berkshire.
Water	58·1	43·0	57·9	43·9	32·9	38·8
Fat	24·6	43·9	24·2	42·3	49·5	46·8
Ash	2·8	1·4	3·9	1·9	2·4	2·9
Proteine	14·5	11·4	15·0	11·9	15·3	12·0

And we see that the American and Illinois product suffers none by the comparison. But it is held by foreign authorities, and justly it may be, that American pork suffers more by shrinkage in cooking than the foreign product, and Brady states (Pavy on Food) that in cooking, American pork loses 50 per cent., while Irish pork loses only 25 or 30 per cent. But this is to be ascribed to the higher proportion of fat it contains, as appears from the figures of our analyses of American bacon as compared with those given by Pavy (Food, p. 155), for fat pork, dried and green bacon. The bacon for our own analyses was secured from a grocer, and was said to have been prepared in Indianapolis. One sample was pickled by immersion in salt solution or brine apparently, and smoking; the other was the best quality of sugar-cured bacon. In preparation for analysis two slices were cut from a side of bacon, and these were cut in very fine strips transversely with good shears, then the whole sample was further reduced by chopping and pounding until a finely divided condition was attained. Finally it was subjected to analysis after the same manner and with the same methods as the pork already described. Our results and the figures given by Pavy are shown in the following table:—

Constituents.	M'Murtrie.		Pavy.		
	Sugar Cured Bacon.	Pickled Bacon.	Fat Pork.	Dried Bacon.	Green Bacon.
Proteine	27·871	1·450	9·8	8·8	7·1
Fat	56·860	84·720	48·9	73·3	66·8
Ash	5·175	3·365	2·3	2·9	2·1
Water	9·174	10·383	39·9	15·0	24·0

Surely the objection urged against American pork in the English publications can not apply to the sugar-cured bacon. Here the proportion of proteine is three-fold higher than in the English, and the water about 25 or 30 per cent. lower. The fat is also lower—but the relations here occurring are due to the fact that the sample represented contained a very high proportion of flesh. In the ordinary green Indianapolis bacon we have a very low proportion of proteine, as compared with the other samples, but the water is not materially higher, and the difference in proteine is largely compensated for in the increased proportion of fat. Yet when we compare the English fat pork with the American product of apparently the same grade, *e.g.*, our fat and green bacon or our side fat, it is evident that the proteine content is relatively higher, and the differences are doubtless due to the systems of feeding, or rather to the character of food supplied abroad. Here, corn is the staple food, and for the pork of commerce almost the exclusive food. Abroad, barley, peas, beans, or rye, and other materials, enter into the rations of the growing and fattening animal, and if we examine the statements of analysis showing the composition of the resulting products, we find them to contain higher proportions of the nitrogenous principles, or proteine, than corn, and it is believed by the best authorities that an increased proportion of proteine in the animals fed on these materials may be due to this fact. But whether it be true or not, so high an authority as Prof. Sanson, of the Agricultural School at Grignon, in France, believes that the addition of such nitrogenous seeds as peas and beans to the rations of hogs greatly improves the quality of the pork. There can, therefore, be scarcely a doubt that, if such material were added to the corn rations of American hogs, the pork would be enhanced in value accordingly.

But it will not only enchance the value of the product; it will increase the quantity as well. If we compare the relations between the proteine and carbohydrates with that in the other products named, we find it to range 1 :8 in the former, and 1 :2·5 or 3·0 in the latter (peas and beans). We know that too great a preponderance of one constituent over the other diminishes the digestibility of both, and causes loss. Fortunately we have definite experiments on which to base our conclusions with this regard, and their results have shown that not only may an improved quality of product be obtained by establishing a proper relation between these constituents, but, with the same quantity of food consumed, there will be a more rapid increase in weight. For the detailed results of these experiments I must refer to Armsby's excellent "Manual of Cattle Feeding," in which these experiments are fully described.

Wolff concludes, from all experiments that have been made, that the following are the best standards for the composition of the rations of growing and fattening pigs:—

Condition of Animals		Quality of Food.				
Age. Months.	Live Weight. lbs.	Total Organic Substances	Digestible Substances. Albumi-noids.	Digestible Substances. Carbo-hydrates.	Total Nutritive Substances	Nutritive Ratio.
2–3	50	2·1	0·38	1·50	1·88	1:4
3–5	100	3·4	0·50	2·50	3·00	1:5
5–6	125	3·9	0·54	2·96	3·50	1:5·5
6–8	170	4·6	0·58	3·47	4·05	1:6
8–12	250	5·2	0·62	4·05	4·67	1:6·5

Wolff recommends beginning with a nutritive ratio of 1 :5·5 and widening to 1 :6·5 toward the end of the feeding period.

It will naturally be asked, how are American pork-producers to obtain this proteine to add to the rations without too greatly increasing the cost of production? and in this connection we may suggest either the culture of peas or beans, or the use of some of the refuse products of the packing establishments, especially the dried blood. When carefully prepared, it is in excellent condition for feeding, and is readily digested by hogs. The rules for calculating the rations according to these proportions or ratios will be found in the work already mentioned, which contains tables showing the composition of various materials available for food.

These relations are important and worthy of consideration by all growers of pork, as well as those engaged in the commerce of the product. The addition of even 1 or 2 per cent. to the quantity of the product would add thousands, and even millions of dollars to the revenues of the industry, while the improvement of the quality that would follow would increase them to a corresponding extent.

I have also been asked to treat of the "quality of pork best suited for food for man, and the chemical changes or causes affecting and impairing the quality of pork," but I feel that I have occupied too much time already. I have touched upon these points to some extent, but the relations have never been studied to that extent that will enable me to present much of general interest. We have shown that the increase of proteine of pork will improve its quality for immediate consumption, and render it more nutritious. We have shewn in the opening remarks that lean meat or muscular fibre, by reason of the acid reaction it acquires, and the presence of the small proportion of pepsin, may become more tender and digestible by breaking down the myosin, but we have not yet alluded to the influence of the methods of preservation upon its quality. This may not be done in extent now, but we may not leave the subject without recalling the fact that the digestible albuminoids of flesh are very soluble in solutions of salt, and that the use of this agent as a preservative must tend to diminish the the digestibility and nutritive value of the flesh to a corresponding extent. The hardening of the fibres by salt also diminishes their digestibility, and hence the flesh should be, as far as possible, consumed in a fresh condition. On the other hand, putrefaction is to be carefully avoided. While it is not always the case, it not unfrequently happens that virulent poisons of an organic character are developed in the putrefactive decomposition of pork and other flesh, and many of the fatal results apparently attending its consumption may be referred to this cause rather than to the trichinæ to which the injurious consequences of pork consumption are so often ascribed. The consideration of the latter must be left to the entomologist and veterinarian.

A low temperature, is the best preservative, though the partial cooking and smoking employed in many of the packing establishments may effect the desired result when carefully applied, and indeed, from a chemical stand-point, it seems that no objection can be raised against it. It prevents putrefaction without reducing the digestibility of the product to any marked degree.

Supplementary Paper on "Chemistry of the Pig."—The subject of the general composition of the carcases of farm animals, produced under varying conditions of breeding and feeding, is one that has received at the hands of agricultural chemists but a limited share of attention. Previous to 1883 almost the sole information we had on the subject was the result of the labours of Messrs Lawes and Gilbert, on the celebrated Rothamstead farm, with some little work performed on the continent. And when, at the request of Col. C. F. Mills, President of the Illinois Swine Breeders' Association, we undertook to collate some facts relative to the chemistry of the hog, the dearth of such information, especially as regards American stock, became apparent. Nothing could be gleaned bearing upon the composition of the carcases of the several well-known breeds, and in the limited time then at command we undertook the slaughter and analysis of selected animals to determine these relations. It was our intention to secure animals of the more prominent breeds, fed according to the generally adopted methods of the best managed Illinois farms, and brought to the condition and weight usually considered best suited for market, but it proved that this was more easily planned than accomplished. On making search for animals just such as were desired, not all the breeds we had in mind could be found. Thus it seemed desirable that the series for the purpose should include animals of the same sex and age, from the Poland China, Berkshire, Chester, Sussex, Essex, and Duroc breeds; but, upon inquiry among the breeders of the section, it appeared that the first two breeds above named were the favourites, and representative animals of only these two breeds could therefore be secured.

The investigation was unsatisfactory on very many accounts, the principal being the comparatively unreliable character of the source from which the material was obtained. This was quite apparent at the time the results were presented, and breeders in the different classes promptly promised to assist in the further prosecution of the investigation, by contribution of animals of known history and of proper age and sex. Relying upon these promises, when the time arrived for the beginning of the experiment, requests were addressed to prominent breeders that they forward good representative animals of the breed in which each one respectively was interested, to be used in this connection. We were, however, greatly disappointed in the responses received, because the only one who agreed to furnish the desired material was Mr George W. Stoner, of LaPlace, Ill. Mr Stoner promptly sent to the University a young Duroc barrow that was used in the experiment.

The objection raised against the previous experiments, and to any others that might be made with animals contributed directly, were that they would not be subject to the same conditions of feeding and management, and therefore would not be fairly comparable. To meet these objections, it was determined to submit the several animals to the same treatment on the University farm for a given period, and then slaughter for analysis. At the same time it appeared desirable to so conduct the feeding as to determine, if possible, the influence of the character of the food upon the production of fat and flesh. The investigation about to be described turned then upon two points:—1, the relative proportions of fat and flesh produced in animals of the same age and sex of the several breeds, fed in the same manner, and 2, the influence of the character of the food upon production of fat and flesh in animals of the same breed, age, and sex.

The difficulty of realising all these conditions may be realised from what has already been said. It was impossible

to secure contributions of pure bred animals suited to the purpose, and we therefore utilised the stock of the University farm, taking a Poland China sow, a Berkshire sow, a Poland China barrow, a Berkshire barrow, and two cross-bred barrows of Poland China-Berkshire stock. These, together with the Duroc barrow contributed by Mr Stoner, constituted the material for the experiment.

The delay in securing material, caused by the profitless correspondence with the several breeders, caused an unfortunate postponement of the beginning of the experiment, which was still further delayed by the excessively cold weather prevailing. The duration of the feeding was not therefore all that could be desired. It began March 14, and continued 45 days. It was intended that the composition of the ration should be graduated according to the directions of Wolff for the production of the best results in fattening, that is beginning with a nutritive ratio of 1:5·5 and widening to 1:6·5 or 7. At the same time it was deemed advisable to distribute the animals in pairs and feed the different couples respectively differently ; that is, so that each one should have rations having a different nutritive ratio from the others. The nutritive ratio is here understood to mean, of course, the relation between the digestible nitrogenous or albuminous constituents of the food, and the digestible non-nitrogenous or carbohydrate constituents.

The food chosen was corn and linseed meal. In these foods the nutritive ratios usually range about 1:8 and 1:2·5 respectively. But on account of the poor quality of the corn of 1883 and the rather inferior quality of the linseed meal procured, these ratios were not realised, and what we had, proved to be 1:8·94 and 1:4·7 respectively. This is shown in the following statement of results of analyses of these products :—

Analyses of Indian Corn and Linseed Meal fed to Experimental Swine.

	Corn.	Linseed Meal.
Moisture	14·675	12·45
Fat	1·14	7·86
Albuminoids	9·99	18·50
Sugar	1·423	0·24
Dextrine	0·555	2·38
Gum	1·47	1·215
Starch	69·10	39·438
Cellulose	1·05	18·175
	99·403	100·258
Nutritive ratio	1:8·94	1:4·7

Calculations of rations were based principally upon the averages of the published analyses of these products, and the animals divided into four lots were fed respectively with mixtures in which the relations of linseed meal to corn were 1:1, 1:2, 1:5, 0:1. These furnished corresponding nutritive ratios as follows:—1:6·82, 1:7·56, 1:8·23, 1:8·94. In view of the fact that the ratios were so wide it would appear that lots 2 and 3 had almost practically the same ratio.

The arrangement of the animals, the mixtures fed, the periods of feeding and the increase of weight during the several periods of the experiment are shown in the following table :—

Record of Feeding and Gain in Live Weight of Experimental Swine.

Breed and Sex of Animal Represented.	Composition of Ration. Proportions of Linseed Meal.		Corn Meal.	Live Weights in Pounds. Mar. 14	Mar. 28	Apr. 14	Apr. 28	Total gain.	Average gain per day.
Poland China Sow	$\frac{1}{2}$	to	$\frac{1}{2}$	130	143	156	162	30	0·66
Berkshire Sow	$\frac{1}{2}$	,,	$\frac{1}{2}$	141	153	169	174	33	0·73
Poland Barrow	$\frac{1}{3}$	,,	$\frac{2}{3}$	136	153	175	175	41	0·91
Berkshire Barrow	$\frac{1}{8}$	,,	$\frac{2}{3}$	130	138	147	156	26	0·57
Cross-bred Barrow	$\frac{1}{6}$	,,	$\frac{5}{6}$	151	158	162	165	14	0·33
Duroc Barrow	$\frac{1}{6}$	,,	$\frac{5}{6}$	130	138	160	175	45	1·00
Cross-bred Barrow	0	,,	1	167	173	193	193	26	0·57

The preparation of the feed mixtures, the feeding and care of the animals were conducted under the direction of Prof. Geo. E. Morrow, Director of the University farm. The animals were enclosed in separate pens, and given of the feed as much as they would consume. As indicated in the table all the animals were weighed at the beginning of the experiment and at intervals during the period of feeding. Fortunately all the pure bred barrows which were of about the same age, also had about the same weight, and since the feed in each case was practically so nearly of the same composition, the increase in weight will be fairly comparable. It appears that of the three breeds as represented in these animals, the Duroc is the most prolific as regards increase in weight, though not greatly superior with this regard to the Poland China. The Berkshire in this case proved to be decidedly inferior.

The increase of weight, as illustrated in the total gain during the period of feeding, and in the average gain per day, as given for the cross bred animals, would seem to indicate that the animals deteriorate as a result of crossing, because in this case their increase in weight is lower than the animals of the breeds from which they sprung, and as an average lower than that of any of the animals represented. And while in the barrows, the Poland China takes the lead with regard to increase in weight, in the sows, the Berkshire has the preference. Yet the figures in this case are doubtless untrustworthy, because upon slaughter it was discovered that the animals were pregnant, a fact previously unknown. Indeed, when this fact is taken into account, their actual or net gain in weight proved to be about the same. But at any rate it would be manifestly unfair to compare the animals with the barrows in the consideration of the results of feeding either as regards the total gain or the composition of the carcase.

At the conclusion of the period of feeding, the animals were all slaughtered on the same day, in fact during the same afternoon. They were all weighed just before being taken to the slaughter-house, and during the process of slaughter the several parts were separately taken and weighed. While the animals were being slaughtered and dressed, the blood, hair, abdominal and thoracic viscera, etc., were carefully weighed. The carcase was allowed to hang over night to harden, and on the following day was cut up. In the latter process each carcase was divided in the direction of the spinal column, into as nearly as possible, two equal parts, both parts carefully weighed, one of them

reserved for store product, and the other taken for analysis. This latter was treated in the following manner:—first, the head feet and leaf lard were removed; then the side fat was taken off. The flesh was next separated from the bones as completely as possible, then the side fat was cut up, the skin and particles of flesh it contained being carefully taken away so as to leave all the fat, but no portions of extraneous proteine substance. After this the superfluous fat was pared off from the flesh. When all the separations were complete, each part was carefully weighed, and the data obtained in this way and during the process of slaughter are recorded in the following table:—

principal constituents of the carcase. But manifestly to determine accurately the influence of feeding upon the production of flesh and fat in animals of the same breed, or indeed in the relations between animals of different breeds, chemical analysis of the parts must be resorted to, and this was taken advantage of in the present instance, with the results detailed below.

The parts of the carcase divided after the manner just described were further reduced by cutting; and from each part, after thorough mixing, an average sample amounting to at least three pounds was taken. These samples were carried to the laboratory, where they were reduced to pulp by pounding in a mortar. The material thus prepared was employed in the analysis.

Record of Slaughter of Experimental Swine.

Parts Weighed.	Poland China Sow.		Berkshire Sow.		Poland China Barrow.		Berkshire Barrow.		Cross Bred Barrow.		Duroc Barrow.		Cross Bred Barrow.	
	Actual weight, pounds.	Per cent. of live weight.	Actual weight, pounds.	Per cent. of live weight.	Actual weight, pounds.	Per cent. of live weight.	Actual weight, pounds.	Per cent. of live weight.	Actual weight, pounds.	Per cent. of live weight.	Actual weight, pounds.	Per cent. of live weight.	Actual weight, pounds.	Per cent. of live weight.
Blood	4¼	2·61	4½	2·57	4½	2·57	3¼	2·08	4¼	2·57	4¼	2·43	4¾	2·46
Hair	1¼	0·70	1½	0·85	1	0·57	1	0·64	1¼	0·75	2	1·14	1	0·57
Uterus and contents	6	3·69	8½	4·87	...	...	...	...	...	...	...	...	...	...
Entrails and contents	25	15·38	22½	12·89	16½	9·43	15½	9·93	24½	14·84	22¼	12·71	10½	10·10
Lungs, liver, kidney, spleen, brain, tongue	7¼	4·46	7¾	4·44	2¾	1·57	5½	3·52	4	2·42	5½	3·14	6½	3·36
Flesh (lean)	49½	30·55	55	31·55	55	31·42	52	33·33	52	31·55	44	25·14	45	23·31
Bones (crude)	8	4·92	8½	4·87	8	4·57	9½	6·09	8½	5·75	8¾	5·00	10	5·78
Side fat	30	19·81	39	22·35	51	29·14	35	22·29	40	24·24	50	38·57	69½	36·21
Kidney fat	4	2·46	5	2·85	7	4 00	7	4·48	6¾	4·09	6½	3·71	9½	4·92
Gut fat	3¾	2·30	2¼	1·28	4	2·28	3¾	2·40	4	2·42	2½	1·53	5	2·69
Skin	6¼	3·54	4½	2·57	4½	2·43	3¾	2·40	3½	2·12	4½	2·57	3½	1·81
Head and feet	13	8·00	10	5·72	12	6·80	13½	8·69	12	7·27	12	6·86	13	6·73
Total	158¼	98·42	169	96·81	166¼	94·78	149¾	95·85	160¾	98·02	162¼	102·80	178¼	97·94
Loss sustained	4¼	2·62	5½	3·15	7	4·00	6¼	4·00	4¼	2·57	12¼	7·00	5¾	2·44
Net weight	162½	101·04	174½	99·96	173¼	98·78	156	99·85	165	100·59	174½	109·80	184	100·38

It is not claimed that the separations of the parts was effected with any absolute degree of accuracy, but it is certain that the fat was perfectly pure and free from any particles of flesh. The loss sustained is in some cases abnormally high, but this is to be explained by the fact that the distance from the farm to the slaughter-house was greater than was desirable, and hence the time intervening between the weighing and slaughter was not inconsiderable.

The figures here given for lean flesh and fat show some marked difference, and may be better seen in the following recapitulation, in which we have gathered the figures representing the percentages of the live weight in each case:—

	Poland China Sow.	Berkshire Sow.	Poland China Barrow.	Berkshire Barrow.	Cross-bred Barrow.	Duroc Barrow.	Cross-bred Barrow.
Flesh	30·55	31·55	31·42	33·33	31·55	25·14	23·31
Fat	24·57	26·48	35·42	29·17	30·75	43·81	43·82

Of course these separations are wholly empirical, yet they afford partial indications of the relations between these two

The principal constituents to be determined were moisture, fat, proteine substance, and ash. By proteine substance we mean everything not fat or mineral matter free from moisture. It fairly represents flesh, pure, or the material developed from the nitrogenous constituents of the feed. In the process of analysis, the moisture was determined by taking a weighed quantity of the material and drying carefully at 110° C. to constant weight. The dried substance was then subjected to the continued and repeated action of ether until nothing more was dissolved. The loss upon drying represents moisture. The loss upon treatment with ether represents fat. For the determination of mineral matter, a weighed sample was strongly ignited until all carbonaceous matter was removed. The residue of ash was weighed. What remained above the sums of moisture, fat, and ash, was reckoned as proteine. This method of determination of proteine was adopted, because of the inconvenience of combustions with soda lime, in presence of so much fat. The Kjeldahal method was tried, but at that time gave unsatisfactory results. In later experiments it has proved all that could be desired. By these methods the following results were obtained:—

Detailed Results of Analyses of Different Parts of Experimental Swine.

(In percentages of each part).

POLAND CHINA SOW.

	Gut fat.	Side fat.	Kidney fat.	Flesh (lean).	Bones (crude)	Skin.	Lungs, liver, kidney spleen, brain, etc.	Head and feet
Moisture	17·26	6·68	3·65	62·14	39·20	57·34	74·28	49·94
Fat -	77·90	90·39	92·18	14·01	21·22	6·72	2·60	26·36
Ash -	2·04	0·05	·002	1·36	25·60	0·29	0·006	10·13
Proteine-	2·80	2·88	4·16	22·49	13·98	41·65	23·114	13·57

BERKSHIRE SOW.

Moisture	16·20	8·41	2·30	66·40	42·02	49·30	74·04	48·10
Fat -	79·93	89·30	93·46	16·38	21·16	4·92	1·90	32·00
Ash -	0·92	0·63	0·006	0·089	29·64	0·96	0·004	9·64
Proteine-	3·77	1·656	4·034	17·131	7·18	45·68	24·056	10·26

POLAND CHINA BARROW.

Moisture	16·21	7·14	3·42	66·82	39·64	55·31	75·00	47·63
Fat -	79·92	89·21	93·62	14·30	20·64	5·56	2·11	29·42
Ash -	1·64	0·009	0·003	2·04	24·89	0·46	0·004	27·16
Proteine-	2·23	3·64	2·947	16·84	14·93	38·67	32·886	15·79

BERKSHIRE BARROW.

Moisture	16·34	6·74	2·46	65·35	43·23	46·66	76·10	50·63
Fat -	79·26	91·20	94·34	12·04	20·46	5·34	0·96	24·30
Ash -	1·06	0·008	0·005	0·846	27·49	0·863	0·005	8·30
Proteine-	3·34	2·052	3·195	21·76	8·72	47·12	22·93	16·77

CROSS-BRED BARROW.

Moisture	13·16	4·34	1·65	65·42	39·34	51·34	74·38	52·24
Fat -	83·45	93·20	94·20	14·32	21·22	6·72	2·40	18·34
Ash -	1·89	0·092	0·006	2·001	24·96	0·099	0·088	13·62
Proteine-	1·50	2·368	4·144	20·06	14·48	40·95	23·13	16·79

DUROC BARROW.

Moisture	14·43	5·79	2·17	67·84	41·06	44·23	77·93	54·10
Fat -	81·12	92·38	96·32	12·13	19·30	4·62	1·82	23·00
Ash -	1·46	0·842	0·019	1·904	29·18	0·578	0·069	11·44
Proteine-	2·99	0·988	1·49	18·126	10·46	50·57	20·18	11·46

CROSS-BRED BARROW.

Moisture	12·10	5·10	1·97	63·24	40·44	49·42	76·34	40·63
Fat -	85·45	93·60	96·40	16·38	20·00	5·52	1·23	30·64
Ash -	1·004	0·069	0·004	2·001	30·42	1·09	0·0094	10·56
Proteine-	1·446	1·231	1·624	17·779	9·14	43·97	22·42	18·20

Upon the examination of this table the variations from sample to sample do not appear very wide. As regards merchantable flesh, as represented in the crude flesh, we have a means for the determination of absolute terms of comparison. Of course the food value of this merchantable flesh depends upon its proportion of the nitrogenous compound proteine present in it. It will depend both upon the moisture, which varies from 60 to 65 per cent., and the fat, which varies from 12 to 16 per cent. in round numbers. Applying these figures, then, to this crude flesh, we find that the proteine contained in it, as referred to percentage of the carcase, is as follows, for each breed respectively:—

	Poland Sow.	Berkshire Sow.	Poland Barrow	Berkshire Barrow.	Cross-bred Barrow.	Duroc Barrow.	Cross-bred Barrow.
Proteine	4·27	5·40	5·27	7·25	6·72	3·95	4·14
Fat -	4·28	5·76	4·49	4·01	4·51	3·05	3·82

From these figures it would appear that the Berkshire is the most prolific as regards production of merchantable flesh. The Duroc barrow stands lowest in the scale in this regard.

These figures are of course referred to live weight. But if we refer the results to only the edible portions of the animals, we have the relations set forth in the following table:—

Composition of Edible Portions of Experimental Swine.

(Expressed in per cents. of carcase).

POLAND CHINA SOW.

	Flesh.	Bones.	Side fat.	Kidney fat.	Skin.	Head and feet.	Total.
Per cent. of carcase -	44·694	7·223	27·088	3·612	5·643	11·738	100·08
Moisture -	27·773	2·8364	1·809	0·131	2·897	5·862	41·303
Fat - -	6·261	1·5327	24·484	3·429	0·379	3·094	39·179
Ash - -	0·6078	1·849	0·013	0·00007	0·0163	1·189	3·675
Proteine -	10·042	1·009	0·780	0·150	2·350	1·592	15·923

BERKSHIRE SOW.

Per cent. of carcase -	45·081	6·967	31·967	4·098	3·688	8·196	99·0352
Moisture -	29·934	2·927	2·6883	0·094	1·818	3·943	40·4043
Fat - -	7·384	1·473	28·545	3·830	0·181	2·622	44·035
Ash - -	0·0401	2·065	0·2014	0·0003	0·0354	0·790	3·0925
Proteine -	7·8035	0·5002	0·5293	0·165	1·684	0·8217	11·5037

POLAND CHINA BARROW.

Per cent. of carcase -	40·073	5·828	37·157	5·100	3·090	8·750	99·987
Moisture -	26·780	2·310	2·653	0·1744	1·709	4·1676	37·794
Fat - -	5·731	1·205	33·146	4·755	0·1718	2·5742	47·583
Ash - -	0·8175	1·450	0·0033	0·00015	0·0142	0·6265	2·9116
Proteine -	6·749	0·870	1·3524	0·1508	1·195	1·3816	11·6988

BERKSHIRE BARROW.

Per cent. of carcase -	43·243	7·900	29·106	5·821	3·118	10·810	100·267
Moisture -	28·260	3·415	1·962	0·1432	1·455	5·473	40·708
Fat - -	5·136	1·616	26·65	5·489	0·1665	2·633	41·690
Ash - -	0·3658	2·172	0·00232	0·0002	0·269	0·8972	3·7063
Proteine -	9·409	0·6889	0·5973	0·186	1·469	1·813	14·163

CROSS-BRED BARROW.

	Flesh.	Bones.	Side fat.	Kidney fat.	Skin.	Head and feet.	Total.
Per cent. of carcase -	42·362	6·924	31·558	5·498	2·951	9·775	99·9212
Moisture -	27·713	2·724	1·369	0·097	1·515	5·106	38·524
Fat - -	6·066	1·469	29·41	5·179	0·198	1·793	44·108
Ash - -	0·847	1·737	0·0299	0·0003	0·029	1·332	3·9662
Proteine -	8·497	1·001	0·747	0·227	1·209	1·641	13·323

DUROC BARROW.

Per cent. of carcase -	34·990	6·958	39·761	5·169	3·578	9·541	101·818
Moisture -	23·74	2·857	2·302	1·122	1·583	5·162	36·776
Fat - -	4·245	1·342	36·723	4·979	0·1653	2·195	49·648
Ash - -	0·666	2·030	0·334	0·003	0·0206	1·091	4·9546
Proteine -	6·342	0·727	0·392	0·077	1·809	1·093	10·440

CROSS-BRED BARROW.

Per cent. of carcase -	29·90	6·644	46·178	6·330	2·325	8·631	100·008
Moisture -	18·91	2·687	2·355	0·124	1·149	3·507	28·732
Fat - -	4·897	1·329	43·32	6·102	0·128	2·644	58·393
Ash - -	0·598	2·021	0·031	0·0002	0·025	0·9114	3·371
Proteine ·	5·192	0·607	0·568	0·1028	1·022	1·572	9·063

Collecting the totals of the above tables we have the following :

General Composition of Edible Portions of Experimental Swine.

(Expressed in per cents. of carcase).

	Moisture	Fat.	Ash.	Proteine.	Total.
1. Poland China Sow -	41·303	39·179	3·675	15·923	100·08
2. Berkshire Sow - -	40·404	44·035	3·0925	11·5037	99·0352
3. Poland China Barrow	37·794	47·583	2·9116	11·6988	99·9874
4. Berkshire Barrow -	40·708	41·690	3·7063	14·163	100·2673
5. Cross-bred Barrow -	38·524	44·108	3·9662	13·323	99·9212
6. Duroc Barrow - -	36·776	49·648	4·9546	10·448	101·818
7. Cross-bred Barrow -	28·732	58·393	3·371	9·063	99·559

The same order of arrangement with regard to the flesh constituent still holds good here for the pure bred animals. For production of flesh the Berkshire stands first, the Poland China next, and the Duroc last. But if we consider the production of fat the order is exactly reversed.

If we consider the relation of the constitution of the feed to the production of flesh and fat, as referred to percentage of carcase, taking the average of the pairs, we find the following :—

Nutritive ratio.	Proteine.	Fat.
1:6·82	13·7183	41·607
1:7·56	12 9309	44·636
1:8·23	11·885	46·870
1:8·94	9·063	58·393

These differences, based upon the averages of the pairs, are quite marked, and we are induced from the general character of the results, to believe that they would be equally so in averages secured with a larger number of animals. With a widening of the nutritive ratio there was a decrease in the production of proteine and an increase of fat production. And it therefore appears that it is possible, by increase of the nitrogenous constituents of the food, to secure an increase of the flesh or nitrogenous constituents of the body. But the question whether the modification of the usual method of feeding with a view to securing such results will be economical in every way, taking the demands of the market into consideration, as well as the increased labour, attention and cost involved, remains undecided, so far as these experiments are concerned. If we compare the record of feeding, leaving out the sows, and taking the averages of the pairs similarly fed, there would indeed seem to be a decrease in the production of live weight, with a widening of the nutritive ratio. But the average daily gain of one of the cross-bred barrows appears abnormally low, and if we reject it, the relations are not sufficiently definite to base any conclusion upon. It is unfortunate that we were limited to so few animals in these experiments, for it is probable that the relations above indicated would have been confirmed by other subjects.

From what precedes, these experiments tend to show :—

1. That in point of flesh production, the Berkshire is superior to the Poland China.

2. That in point of production, total live weight, these relations are directly reversed.

3. That increase of nitrogenous matters in the feed, increases the production of flesh in preference to fat in the animal body.

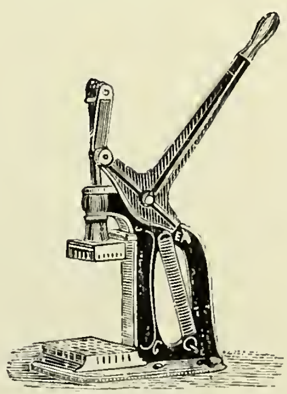
4. That the narrower nutritive ratio has a tendency to increase of total gain of live weight.

5. That the addition of nitrogenous matters, such as cotton and linseed meal, or even of dried blood prepared at the packing establishment, is worthy of the serious consideration and careful experiments of all interested in the great industry of productions of meats.

Chicken, Ham, and Tongue Dye. — see Ham, Tongue, and Chicken Sausage Dye.

Chicken, Ham, and Tongue Sausage.—see Ham, Chicken, and Tongue Sausage.

Chill Room Temperature.—see Temperatures for Bacon Curers.



Chip Potato Machine.

Chip Potato Machine.—The illustration of this machine shews pretty well the full particulars. A frame of knives intersecting each other in squares is fixed on the bottom part of machine. The block at end of plunger is grooved to suit the spacing of the knives below. The potatoes are placed on the knife frame and forced through by working the lever.

Chitterlings.—Chitterlings are made of the intestines—small, large, and stomach—the secret of making good sweet chitterlings is to see that they are handled without delay after being taken from the pig—if left without being cleaned for any length of time, they will be dark and unsatisfactory.

The proceedure is to place the intestines, as taken from the carcase, on a clean bench, trim off the caul fat, cut off the stomach. Slit open stomach on the concave side, turn inside out and empty of contents, well rinse, and place in tub of clean cold water, then find end of small intestine, and run off from fat, the large intestine is next separated, taking care not to break the gut in the operation. The intestines are now stripped in the usual manner of all mucus, etc., and placed in a tub of cold water, after which they are ready for turning inside out. The tool required for turning is a round stick about half-inch in diameter, and about eighteen inches long, and rounded at the ends. The method of turning is to take up one end of the intestine, place across end of stick, push inside intestine, and with a quick motion of the hand pull all the intestine over the stick. When second end of intestine is reached, the whole will be found to be turned inside out. In this position it is pulled off stick, this will be found by a little practice much easier to perform than describe. Large and small intestines are similarly turned. They are now well rinsed and placed in tub with stomach. The whole should now be well stirred round with a good stiff broom in several changes of clean cold water, until they are quite clean and free from all dirt and objectionable matter. The small intestine is now *plaited up*, and the whole placed in copper and pan boiler, with a little salt and antiseptic added to the water. When sufficiently cooked they are withdrawn and placed in tub of clean cold water till cool, *not saturated.* When they are taken out and drained, they are ready for use.

Choppers.—The use of choppers is so obvious that any special description is unnecessary. There are a great variety of choppers, depending largely on different districts, but the general designs are as illustrated on next page.

Cinnamon.—The cinnamon of commerce is the bark of the cinnamon tree, which is a native of Ceylon. Good cinnamon should be fine, thin, brittle, and of a yellowish brown colour, with a sweet aromatic taste. The finest qualities should not be thicker than brown paper.

In its natural state the tree grows to a height of from twenty to thirty feet, with a trunk varying from twelve to eighteen inches in diameter—the external bark being thick, rough, and of ash colour, while the inner bark is reddish. In cultivation the trees are usually kept at heights, not exceeding about ten feet, as it is from the young wood and the fresh branches that the best quality comes. The bark is stripped off by running a knife along the branches on both sides and then gradually loosening it. It is then placed in a cool place, and after undergoing a kind of fermentation, which allows the epidermis to be easily scraped off, it is laid out in the sun to get thoroughly dried, when it assumes the quil-like appearance. The process of harvesting is carried on twice a year—in June or July, and again in November or December.

Cinnamon is a stimulant and a great help to digestion, and has always been held in high esteem. Both cinnamon and cassia are mentioned as precious odoriferous substances in the Mosaic Writings. The bark was an article of export from India in the most remote times, and long before it came into use among the masters of the ancient world.

Diversities in quality seem to arise largely from the care and skill displayed in preparing it, and of course the age of the plant, and the soil and temperature of the country, have their share in making prime quality. The trees to thrive well, should be grown in a silicious soil with plenty of vegetable mould mixed into it.

Circular Balances.—see Weighing Machines.

Cleavers.—These are large sized choppers used for cutting carcases in two, and are made sometimes with iron handles Fig. I. or with wooden handles as Fig. II.

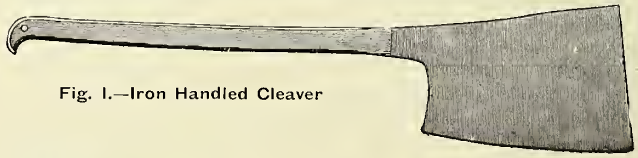


Fig. I.—Iron Handled Cleaver

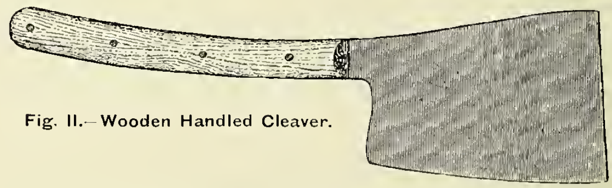


Fig. II.—Wooden Handled Cleaver.

The wooden handled cleavers are most in demand as they are supposed to give a better grip for the hands. Cleavers vary in weight from about 4 lbs. up to about 10 lbs., although the weight for an ordinary man's use is about 7 lbs.

"Climax" Tickets.—These tickets can be had in a large variety of shape, colour, and design. They are patented in the United Kingdom. They stand a lot of tear and wear, and can be washed with impunity. Briefly, they are made of lithographed tins, turned over at the edges, and have one or two spikes according to size for sticking into the meat. They are certainly very attractive.

"Climax" Tickets.

Clothing.—There are some well recognised designs in clothing for the meat and provision trades, and it is hardly necessary to do more than give illustrations of some of the most popular designs. Serge, jean homespun, drabette, duck, bluette, drill, etc. represent the materials from which this class of clothing is made. It is essential that the cloth should be a washing material and that the dyes should be fast.—see page 136.

Clotted Cream.—This product is mainly produced in the counties of Devon and Cornwall under the style of *Devonshire Cream or Cornish Cream.* The taste is an acquired one by most people, and to many who have only heard of cream under these names the first acquaintance is often disappointing. There are immense quantities used however, and the preparation is pretty much the same in both counties. On the small scale milk is left to stand for

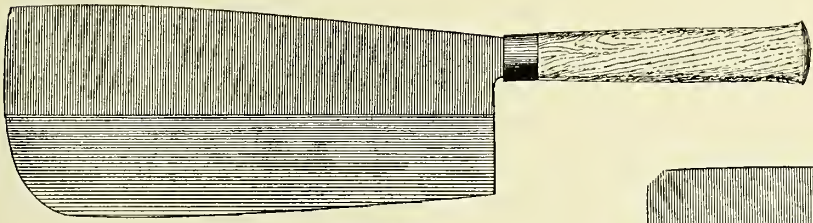


Fig. I.—Calf Chopper.

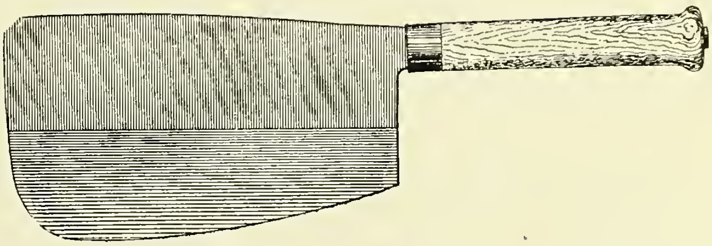


Fig. II.—Smithfield Chopper.

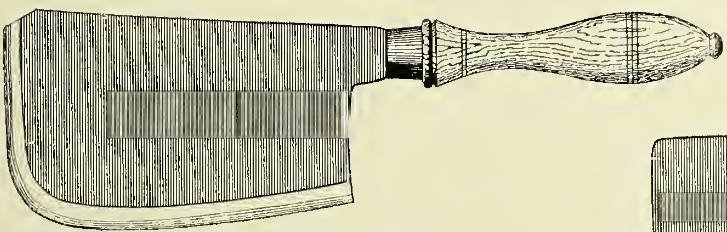


Fig. III.—London Chopper.

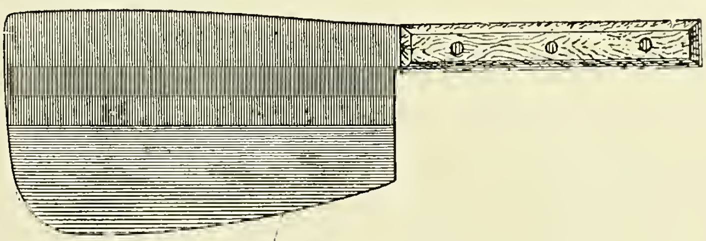


Fig. IV.—Smithfield Chopper with bevelled handle.

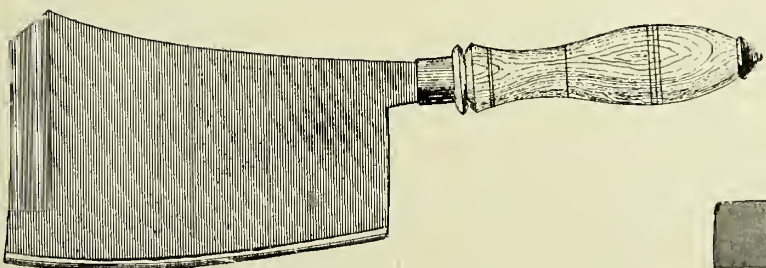


Fig. V.—Ordinary Pattern Chopper.

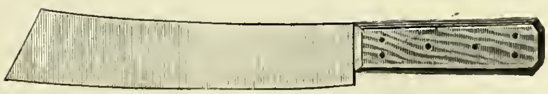


Fig. VI.—Breast Chopper.

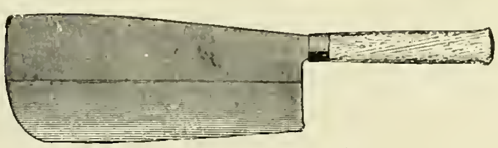
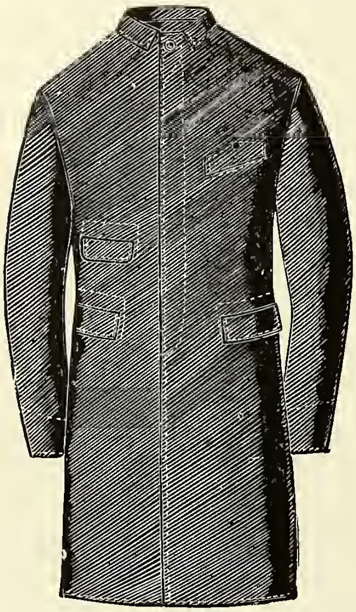
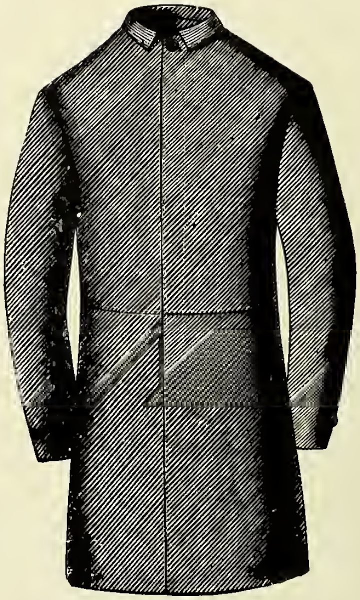


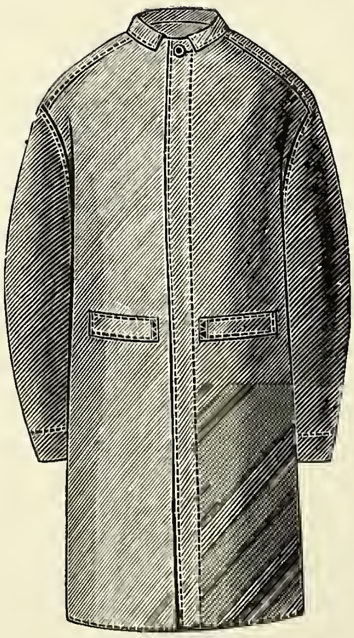
Fig. VII.—Lamb Chopper.



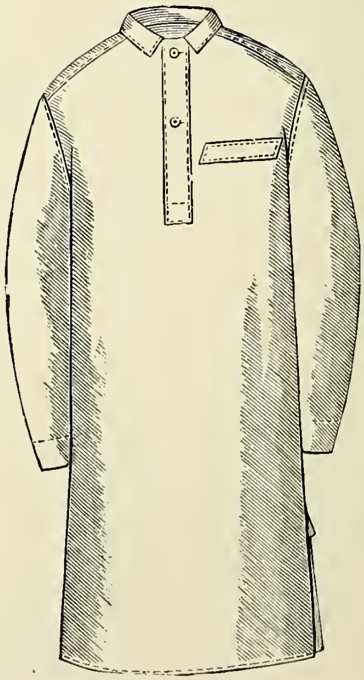
Oxford Coat



Frock Coat.



Open Frock Coat

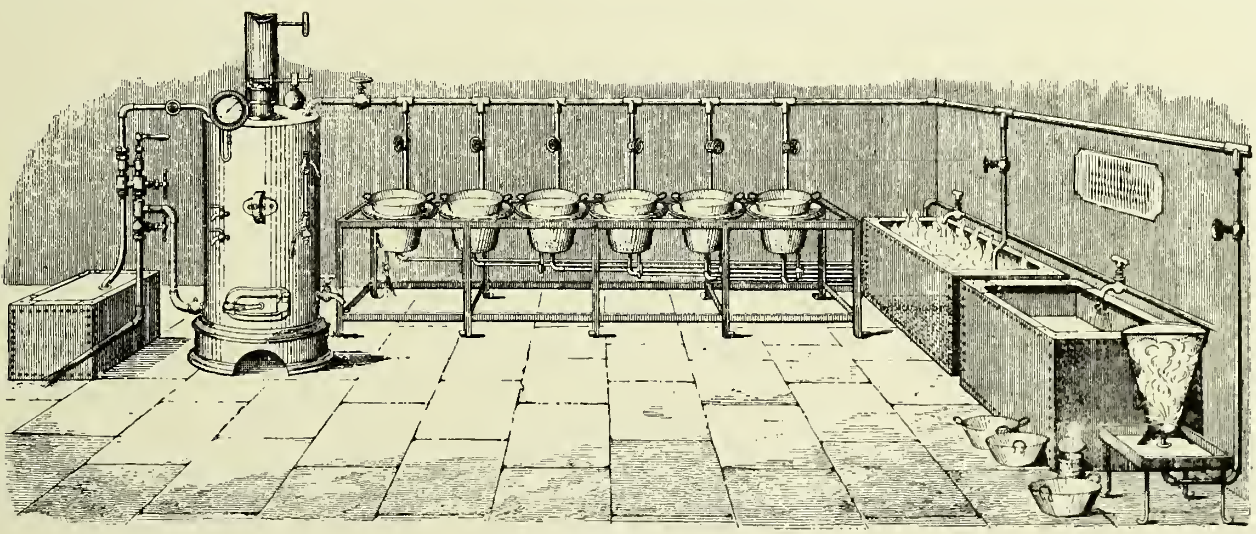


Long Round Frock Coat.

about 12 hours in shallow pans, during which time the cream or fat globules partially rise to the surface. After that time the pans are placed on slow fires and the milk gently heated to about 180°. During this heating all the living ferments are destroying, and the cream combined with the coagulated albumen rises to the surface. After heating, the shallow pans are cooled in running water and the cream separated off. On the large scale steam is used as the heater and a refrigerator as the cooling appliance. The illustration shows a complete steam plant.

Refrigeration may be applied by circulating brine round the shallow pans or simply placing them in a cold room at 38° to cool.

Cloves.—The dried flower-buds of the clove tree. This elegant tree grows spontaneously in the Moluccas but has been cultivated in the Mauritius and Bourbon; French Guiana and the West Indies, Zanzibar, Pemba, Amboyna, Java, Brazil, and other places also produce cloves in varying quantities and qualities. The smaller Amboyna cloves are the best quality, possessing as they do the essential, strong, acrid, aromatic flavour. Zanzibar cloves are, so far as quantity is concerned, the leading line in the English market. The produce of one tree may be taken at an average of about 15 lbs., although in some cases 20 lbs. is a common figure. The harvesting is done in November and December and the drying process is accomplished by smoking them on hurdles covered with matting near a slow wood fire to make them take on the brown colour, then they are exposed to the sun to polish them off.



Clotted Cream Plant.

Coblenz Sausages.—These are favourites, small and cheap. Like the Vienna sausages both veal and pork are used, and it is left to the choice of the maker how much of either to put in, the cheaper one at the time usually being put in.

Say 10 lbs. pork, 10 lbs. veal.

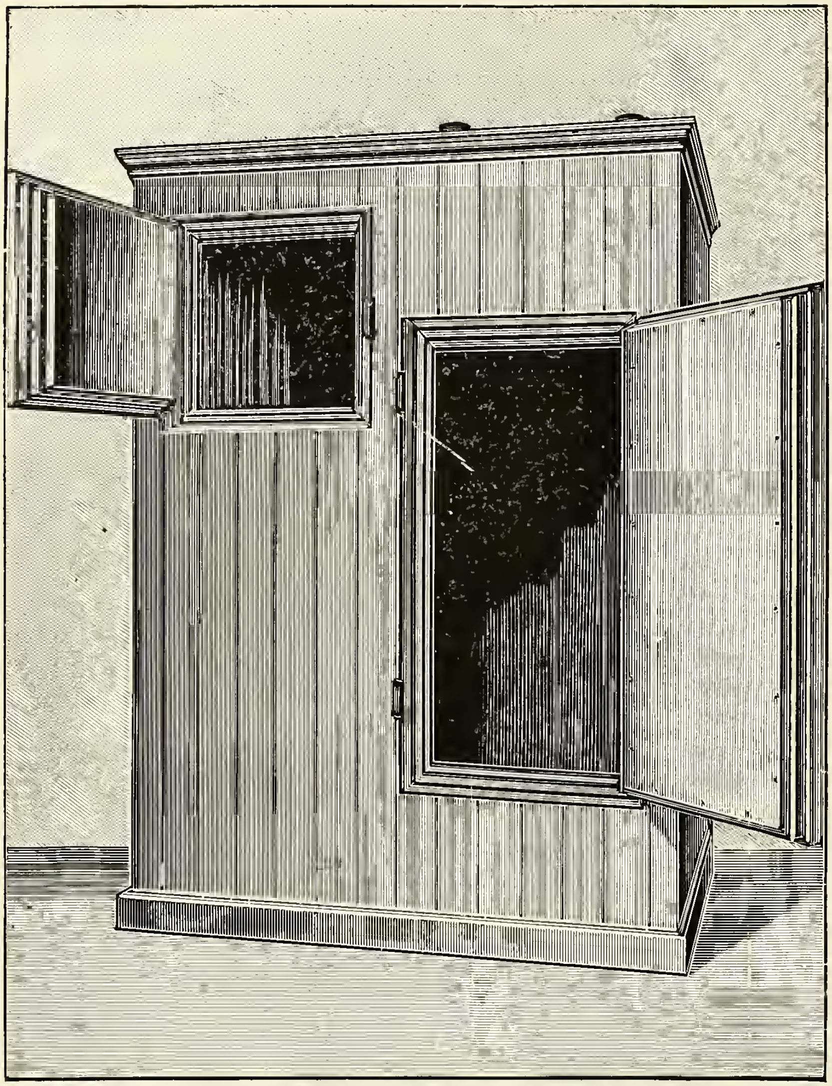
Let them lie for some days in a salt pickle of 12 oz. salt, ½ oz. saltpetre. First chop the veal very fine, then add the pork and chop all together, it not being necessary for the latter to be so fine. Add 1 oz. white pepper, ⅓ oz. fine mace, ⅓ oz. fine white ginger, ⅓ oz. peppermint, three sticks eschalots, two sticks garlic, and mix well through the meat. Mince till the fat shows through the rest like pin heads; then work in as much water as the meat will take, making it very stiff, and then put in 4 lbs. of fresh meat, ready prepared, and work all together for a quarter of an hour. Fill into narrow pig skins, not too tight, making six sausages to the pound. Let them hang on sticks outside for some hours to dry in summer; in winter, in a warm room. Then smoke with oak, beech, and a little pine sawdust—temperature 100° Fahr. Let them hang until they are a beautiful yellowish-red colour, which will take about three-quarters of an hour. Small smoking-rooms are best for this purpose. Let the sausages simmer six to eight minutes in water before using. A splendid restaurant sausage.

Cochineal.—An insect common in the Canary Islands. The insect is about the size of a small pea and exists by attaching itself to the leaves of the fig tree from which it extracts the juice. The black grain cochineal produces the carmine colour while the silver grain makes lighter tints. The colours produced are of a rich beautiful tint and are much prized for culinary purposes.

Cold Chambers.—The cold chamber used by butchers, poulterers, etc., consists of a room provided with appliances by which its temperature and that of its contents is maintained at a considerably lower point than the outside atmosphere. It is a matter of common knowledge that the decay of all kinds of perishable goods is retarded by a low temperature. The model cold chamber is that which in the most economical way maintains a low and constant temperature and a dry atmosphere with freedom from germs or taint.

The "Douglas" Cold Chamber seeks to fulfil the above conditions in the following way:

(1) The insulation of the sides, top, and bottom is very perfect and only the minimum of heat can pass from the outside atmosphere to the interior of chamber.



Douglas's Cold Chamber for Butchers.

(2) All joinings and the edges of doors are fitted air-tight, and the doors are packed with rubber round the edges and closed perfectly tight by special and powerful lever fasteners.

(3) All the internal fittings are made of galvanised iron, and the interior is covered over with sheet zinc and the metallic surfaces permit of ready cleaning and do not harbour germs as wood does.

(4) The cooling is done by ice, which is packed in a strong wrot iron and wire galvanised cage, permitting of the freest access of the hot air from goods to the ice, thus promoting rapidity of cooling and the disposition of impurities directly in to the ice. The melted ice is received by an insulated drip tray and run off by a trapped pipe and the whole arrangement produces a very dry pure atmosphere.

(5) When goods at the outside temperature are put into the chamber there is an instantaneous development of steam and expansion of the air from the increased heat. The escape of this steam and hot air is provided for by a number of automatic ventilators in the roof of the chamber which are lifted by the expanded air. When the goods are cooled down somewhat the ventilators close and prevent the ingress of air from the outside atmosphere.

Many attempts have been made to use freezing mixtures, of ice and salt, etc., in these chambers, but these have simply led to expenditure of ice and irregular temperatures.

The great desideratum at present is a small cheap refrigerating machine which could be applied to butcher's chambers, as mechanical refrigeration is much cheaper than that produced by ice. A machine recently patented by Mr T. Douglas and Mr G. Conroy seems to have solved this problem, and it is being largely sought after by those engaged in the food trades.

Cold Chamber Thermometer.—see Thermometers.

Cold Lard Filler.—In filling lard into bladders it is considered an advantage to do so cold. Hence a cold lard filler is a necessity.

The special form found most suitable is that of a vertical cylinder mounted on a stand and fitted with a plunger which is moved up and down by means of bevel wheels propelled from a hand driven wheel. The plunger is accurately fitted so that no air will pass, and when the machine is about to be used this plunger is let down to the bottom of the cylinder.

The cylinder is connected up to the lard agitator, from where the supply of lard is drawn by the plunger being raised until the cylinder is full. As soon as this is accomplished, a tap in connecting pipe is turned so as to shut off the supply of lard. The filling of the bladders then begins. The bladders are fixed on nozzles which are placed at the bottom of the cylinder and are held in their position by clips round the nozzle. The plunger is then lowered and as the cold lard is forced into the bladders they are floated in water to relieve the weights. The bladders are filled up tight and immediately tied at the neck with pieces of white string. A portion of the neck of the bladder overhangs, but this is trimmed off and the bladders floated in cold water to further harden the lard.

Cold Storage of Eggs.—The keeping of eggs in cold stores has grown to be a large industry in America, and it is calculated that about £4,000,000 worth are stored annually in the United States. The question is attracting much attention in this country and on the Continent, and already considerable stores are being put down for dealing with eggs, while many general cold stores receive them with other goods. The following points in connection with the storage of eggs are derived from the best American practice.

The best temperatures are 40° F. for periods up to three months, but if it is intended to store the eggs for longer

periods they should be maintained at a temperature of 30° F. right from the beginning.

The moisture in the atmosphere of the egg store should be from 70 to 80 per cent. as determined by the hygrometer. No dirty or cracked or small eggs should be stored, and the temperature of the eggs should be reduced gradually on going into the store, and also brought up again gradually on leaving the store.

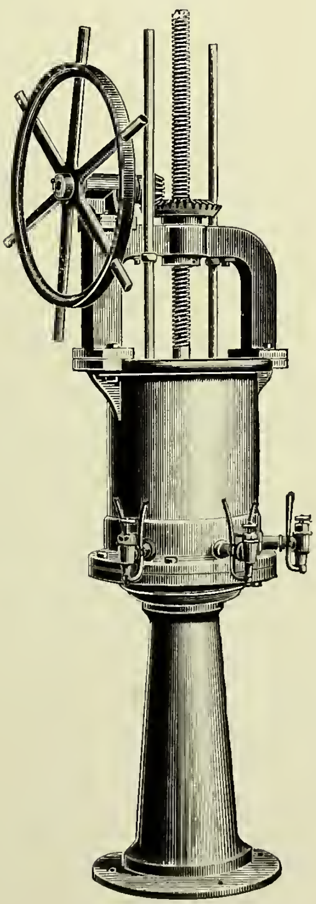
It is better to have small stores of eggs, which can be filled up and left undisturbed for a long time, than large ones, which are frequently opened and batches of fresh high temperature eggs put in.

The method of cooling egg stores may be with brine drums and pipes, but it is necessary in addition to have a good and regular circulation of cold air.

For further information see "Eggs in Cold Storage," by Madison Cooper (H. S. Rich & Co., Chicago). See also Butter and Egg Storage in Belgium.

Cold Stores.—see Refrigerating Machines and Insulation

Collared Head (Bath Style), is made pretty much in the same way as ordinary collared head as to curing, boning, cooking, and chopping—the extra requirements are about three whole pigs' tongues to each tin or "roll." Whatever rind available is also stripped from the joint or carcase, leaving about half-an-inch of pork fat adhering to the rind. The rind and fat are cooked slowly, so as not to shrink the rind more than can be helped.



Douglas Cold Lard Filler.

Cold Lard Filler in use.

(Douglas's Cold Lard Filler at work showing the bladders in position, filled and floating in water. The tank above is a rectangular shaped lard agitator).

When the material is cooked and ready for dishing, the rind is taken and placed as an inside lining to the tin or mould. It is not necessary that the rind should be in one piece, but the pieces should be joined together as neatly as possible. The dish is then filled up and the tongues—after being skinned—put in point downwards as perpendicularly as possible in the approximate centre of the dish (but slightly apart), and the whole is then pressed.

When cold and turned out, the rind will be outside with a nice white selvage of fat all round the brawn.

Collies.—see Sheep Dogs.

Colonial Produce.—see under the name of each Colony.

Cookers.—see Ham Cookers.

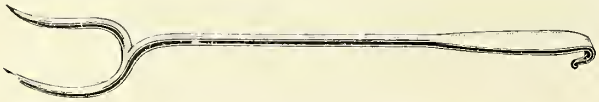
Cooking Basket.—A strong basket made of galvanised wire, used for putting goods into when cooking in the ordinary copper or pan. The basket holds the goods safe, and, as only a small amount of handling is necessary, damage is prevented when lifting out or putting into the copper.

Cooking by Steam.—see Steam Cooking.

Cooking Hams.—see Ham Cooking.

Cooking Pans for Pork Purveyors.—see Pork Purveyor's Cooking Pans.

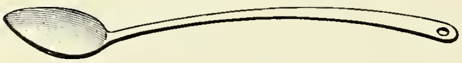
Cooks' Utensils.—There are certain recognised tools which are essential to every cook, besides the usual fittings of a kitchen, and they are equally suitable to pork butchers



Cook's Fork for use in copper.

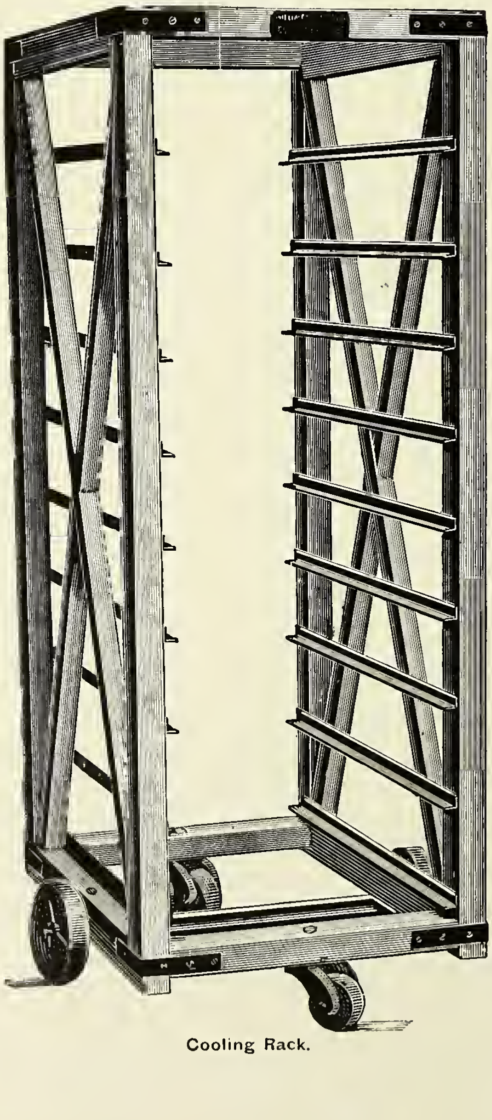
Cook's Ladle.

Cook's Perforated Flat Skimmer.



Cook's Spoon.

and small goods makers. These tools, for the sake of cleanliness, should always be tinned, and should be strongly made so as to stand usage.



Cooling Rack.

Cooling Rack.—Used by pie, brawn, sausage, and small goods makers for cooling their goods. It is a strong frame mounted on wheels. The frame has grooved irons fitted on either side to carry the trays containing the freshly cooked goods. When full the rack is pushed into a cool passage or specially constructed cooling chamber, where either an ordinary draught or chilled air is made to operate on it, and thus quickly cools the articles. The goods can then be packed and sent off to their destination much sooner than if the rack was not in use. Manufacturers of small goods will readily appreciate what a saving of even a few hours means.

Cooling Tower.—The cooling of air in connection with cold storage installations has of late years assumed great importance, and consequently has attracted much attention among refrigerating engineers. Most of the inventors dealing with the subject have approached it from the purely mechanical point of view, and have sought to attain the end by passing the air to be cooled over stacks of pipes, through which cold brine is circulated, or over discs revolving in cold brine, etc. Air is an extremely elastic body, and it possesses great power of eluding detailed contact of its particles with liquids or solids. It is also a very bad conductor of heat, which is conveyed through it chiefly by convection or the contact of the molecules in motion. These considerations suggest that extremely large cooling surfaces are required for the rapid refrigerating of air, and no mechanical arrangement supplying the surfaces in the necessarily small area has yet been devised, and even if it could be devised, the cost would doubtless be prohibitive. Increased efficiency must be looked for in another direction. The inventor has had considerable experience in the absorption of small percentages of acid vapours out of large volumes of gases in connection with the manufacture of vitriol. For this purpose the "Gay Lussac Tower" is quite the best apparatus that has been devised. It is packed with pieces of coke, and the gases to be treated in passing up through the coke meet with a decending current of absorbent vitriol. Coke "scrubbers" in gas works are on the same principle, and coke towers have also been adopted for the washing of traces of ammonia and the condensation of tar out of enormous bulks of blast furnace gases. Coke is peculiarly suited for the above purposes. It is not affected by chemicals, and withstands the corrosive action of strong vitriol and acid gases for many years. It breaks into very irregular pieces, and packs with plenty of interstices for the passage of gases, so that very little pressure is required to drive air through it. Its spongy nature and rough surfaces are also important elements among those which make it pre-eminent as a medium for bringing gases and liquids into contact with one another. It seems extremely probable the coke tower would be a very effective apparatus for cooling air by bringing it into direct contact with cold brine, and the experiments that have been made have fully borne out this opinion. Take for example the following:—

Test made 6th December 1900.—Apparatus.—Cylindrical gas engine water tank, 2 ft. in diameter by 4 ft. 6 in. deep, used as tower. Funnel-shaped cover fitted to top, containing rose spraying apparatus to distribute cold brine. At bottom of "tower" 9 in. left vacant to form distributing chamber for air coming in. Grating carried over at 9 in. level, and coke to depth of 3 ft. 3 in. packed above it. At top 6 in. left vacant. Air taken from atmosphere by No. 1 Root's

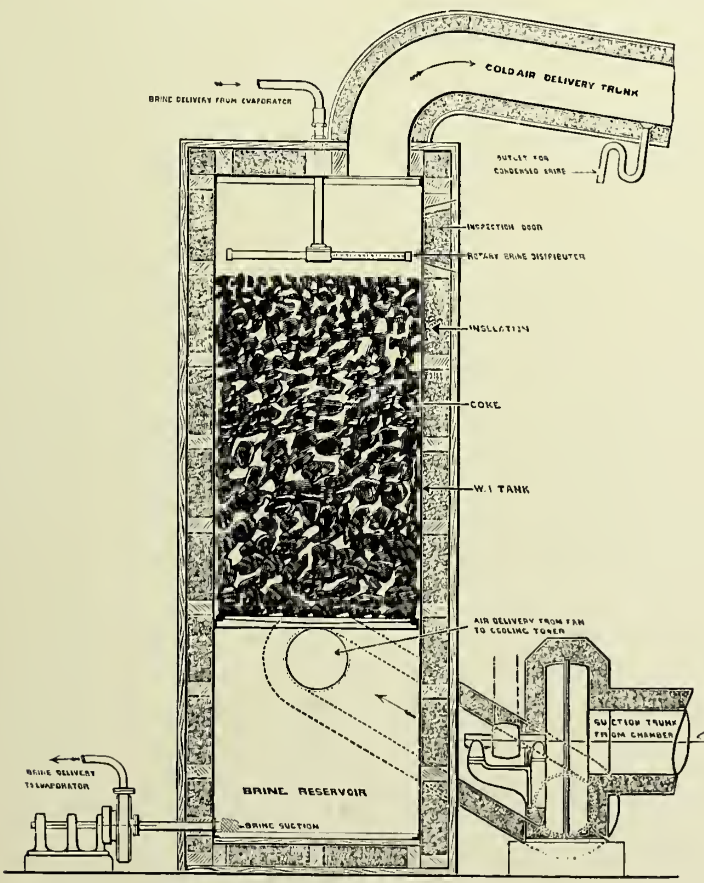
blower, driven at 900 revolutions, which is three times the correct speed, and passed through 1 in. pipe into air distributing space at foot of tower. Cold brine supplied from evaporator of Douglas-Conroy S.O. 2 refrigerating machine. While brine was being cooled down, it was circulated at same time through tower by small rotary pump, so that the temperature everywhere was uniform. Air outlet $2\frac{1}{4}$ in. in diameter, with thermometer fixed in it, and also anemometer, consisting of bent glass tube containing water coloured with ink. Temperature of air supply taken at outlet of Root's blower. The high speed the latter was run at heated it rapidly, and the inlet air therefore rose in temperature quickly. Temperature of brine supply taken in evaporator, and of brine return where it flowed back to evaporator, the tower being elevated so as to permit of the brine returning by gravitation. Tower and pipes insulated. Calcium chloride brine used; strength 31° T at 36° Fahr. From direct observation it was calculated that 70 feet of cooled air passed the outlet per minute, and that 200 gallons of brine was circulated per hour. Stock of brine about 50 gallons. As it was wished to observe the behaviour of the tower with rising temperatures, the refrigerator was stopped when air was turned on.

3.15 p.m. refrigerator stopped.

Temperature of brine flue 17° Fahr.

,, ,, return 20° Fahr.

Air turned on.



Plan of Douglas's Patent Cooling Tower arranged with lower part as Brine Reservoir.

Time.	Brine Flow.	Brine Return.	Air Entering Tower.	Air at Exit.	Anemometer.
P.M.	Degs. Fahr.	Degs. Fahr.	Degs. Fahr.	Degs. Fahr.	
3·30	18	22	62	26	6/10″
4·0	23	26	66	29	6/10″
4·30	27	30	66	32	6/10″
5·0	31	34	67	33	9/10″
5·30	34	36	69	38	8/10″
5·45	36	38	69	39	7/10″

Other tests shewing similar results could be given, but the above is sufficient to prove the efficiency of the apparatus. In addition to high efficiency the tower has the further merit of being relatively very cheap. It can readily be modified in design to suit different requirements. It may be (1) elevated above the level of the evaporator, so that the brine returns by gravitation; or where this is not possible, it may be (2) connected to a brine storage tank, from which the brine is pumped back to the evaporator; or (3) the foot of the tower may be made into a brine storage tank; or (4) the evaporating coils may be placed in the lower part of the tower, combining air cooler and evaporator, in one apparatus; where height is not available (5) two or more towers may be placed alongside; or (6) a horizontal tower may be formed with diaphrams dividing the coke.

Objection may be taken to the bringing of the air into direct contact with the brine. Certainly there will be some dilution of the brine by the absorption of moisture from the air, but this can be dealt with in large plants by drawing off periodically a portion of the brine and concentrating it in a shallow iron tank by the aid of a steam coil or other source of heat, and in small plants by running away the surplus brine and strengthening the remainder by the addition of ca. cl. 2. It may also happen that some brine spray is carried out of tower with the air current, but by proper arrangement of the air trunks, this can be condensed and trapped. The best reply to the above objection, however, is that the system of cooling air by direct contact with cold brine is already extensively carried out by means of rotating discs, sacking, etc., coated or soaked with the brine, and good results are obtained by this method on a large scale.

The special value of this tower lies in its perfect effect in cooling the chill rooms of bacon factories also the chill rooms of abattoirs. It has been applied to other purposes besides, and is likely to have universal application. It is very simple and cheap.

For cooling sausages the tower has been proved to be by far the best appliance, inasmuch as it removes the moisture rapidly. Similarly, whenever moisture is present in excess this cooling tower is obviously preferable to any system where the air is not so finely divided.

Coppers.—see Boiling Pans.

Coriander Seed. — Grows in the South of Europe and the Eastern Countries of England. It is the fruit of an annual plant, and when dried has a peculiar aromatic flavour.

Cork Cold Storage Company (written January 1900).—Early in 1897 Alderman Henry Dale, J.P., conceived the idea that cold storage was much wanted in the city of Cork. Butter bulks very largely in the exports from that port as well as other provisions, and in the heat of summer, trade could only be carried on with England in butter, at least, if the consignees agreed to accept it in a semi-oily state. It was obvious that, if the city on the Lee was to maintain its position at all as a butter centre, it must be on a level with the continental shipping ports. From these latter, butter arrives in England all the summer in a fine firm condition, this being due, in the first place, to the chilling before it is shipped, and secondly to the fact that all the boats carrying butter from the Continent are fitted with refrigerating plant.

Besides the advantages of cold storage for butter, there was the very apparent advantage of the saving of valuable food and produce for the consumption of the inhabitants. In the parliamentary borough of Cork there are some 110,000 people. Such a vast populotion has to be supplied with a quantity of fresh food. There is no refrigerator in connection with the markets, although furtive attempts have been made from time to time to supply one. Now the necessity for such has altogether disappeared, inasmuch as the Cold Storage Co. have sufficient accommodation not only for the butter of Cork, but for the provisions that may

Alderman Henry Dale, J.P.
Chairman of the Cork Cold Storage Co., Ltd.

want keeping in warm or muggy weather, for the one is quite as destructive to meat as the other. Turkeys are largely exported from Cork, and nothing can be finer in the world in the shape of turkey than a bird that has been kept in cold stores. The same remark applies to geese and other fowls.

Alderman Dale found ready supporters of his scheme in Messrs Hickie, Thompson, Morrogh, and Flavin, and very soon these gentlemen associated themselves into a limited company under the style of the "Cork Warehousing, Cold Storage, and Pure Ice Co. Ltd.," and they straightway took splendid premises in Beaseley Street, off the South Mall, Cork. Mr Dale was, and is, chairman of the company, and has put in more work in connection with its welfare than any other man. The drudgery of obtaining the initial information, getting people to become interested, and carrying an idea of this sort to a successful issue generally falls to the lot of one man. Few who have not gone through with it know what it means.

The original intention was to use gas engines. This latter provision was speedily upset, however, as the gas engines had to be removed owing to the vibration, and electric motors substituted instead. This feature makes the plant unique as, at the present moment, there are few refrigerating plants driven by electric power. Some four years ago Messrs Douglas installed what was perhaps the first refrigerating plant in England (at Lynmouth, Devon), driven by water turbines. They have successfully installed a number of electrically-driven single machines, but none on so large a scale as at Cork.

The specification provided for three independent refrigerating machines, worked with separate engines, and all to be interchangeable one with the other. The space to be cooled was 40,000 cubic feet to a temperature of 20° Fahr. At the same time six tons of ice were to be made daily. This undertaking has been a good deal more than carried out by the contractors, and the plant installed will exceed its guarantee very considerably. This fact will be taken advantage of to increase the ice production, as its provision fell altogether short of the demand during last summer.

The contractors supplied three of Hall's No. 10 horizontal patent carbonic anhydride refrigerating machines. Each of these is complete in itself, and has its own evaporator and condenser. Each machine is capable of making six tons of ice every twenty-four hours, making the total capacity of the plant equal to the production of eighteen tons of ice per twenty-four hours, or equal to the refrigerating effect of the melting of thirty-six tons of ice with cooling water at 65° Fahr.

A machine consists of the following parts:—compressor, condenser, evaporator, and cooler.

The compressor is attached to a strong iron bed of box section, and it is fitted with a piston rod of steel. The crosshead has a large pin and ample sliding surface. The connecting rod is of steel, and it is driven by a steel crankshaft, carried on one side by a bearing lined with white metal formed in the end of the bed, and on the other side by an independent bearing. There is a fast and loose pulley, and they are fixed to the crankshaft between these two bearings. The fast pulley has a thickened rim, and it constitutes a flywheel. The revolutions are ninety per minute.

The condenser consists of sufficient surface of wrought iron coils contained in a wrought iron tank. Within these coils carbonic anhydride liquefies, owing to the compression and the cooling action of water which is constantly running over them at a temperature of 52° Fahr., it being derived from an inexhaustible well.

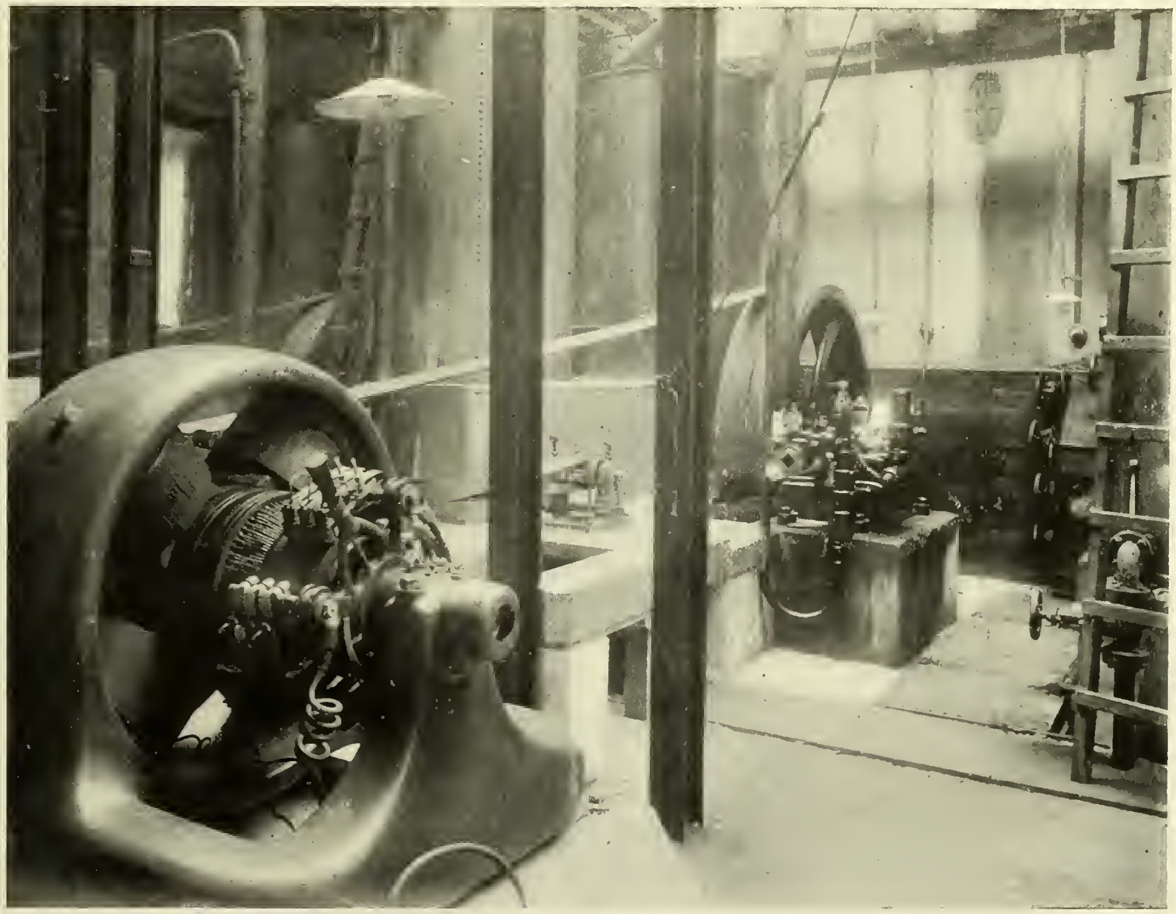
The evaporator consists of a sufficient surface of wrought iron coils also contained in a wrought iron tank. In these coils, owing to the movement of the piston of the compressor

causing a reduction in pressure, the gas evaporates, and brine which is poured over these coils has a portion of its heat extracted, thus producing a cold brine. This brine is conveyed either to the ice-making tank or to the cooler, which is situated in the top of the building. The cooler consists of about 700 ft. run of $1\frac{1}{4}$ in. wrought iron pipe, coupled together with continuous coils, and forming a large surface through which cooled brine from a machine is circulated. The whole of these coils are close together, and divided by a diaphragm, the one half from the other, so that air, which is propelled through amongst the pipes, comes into contact with the largest possible surface. This air is the air of the chambers, which are six in number, the building being in three floors, and there being two rooms on each floor. The total capacity cooled is 40,000 cubic feet, and this space can be kept at a temperature of 20° Fahr. if required. The only system of cooling is by circulating the air over the air cooler by means of a powerful Sturtevant fan. Each chamber can be shut off at will, and any single chamber can be kept at any degree required.

Throughout the three floors is a power lift capable of raising half a ton at a time; there is also a triangular wall crane for emergencies. The ice tank has a capacity of six tons per twenty-four hours, and this quantity is produced. The ice is transparent, and free from all sediment, owing to fact that a very efficient filter is used to filter the water. The water is agitated by a specially designed apparatus so as to liberate the air bubbles. Overhead is an automatic travelling crane which works very smoothly by means of the independent motor attached. A whole section or framework filled with ice moulds is lifted at one time, carried along the rails and lowered into the thawing tank, raised again, and the blocks are let on to the dumping table without any trouble.

The insulation is very perfect, being composed of 1 in. boards, 7 in. standards, packed between with silicate cotton, 1 in. boards, insulating paper, and 1 in. boards again, and the result has proved that there is practically no radiation.

As stated, the power is electric, and the object the electric engineer had in view was to avoid entirely the use of wasteful counter-shafting, and at the same time to have complete interchangeability and independence of units.



Single 25 H.-P. Motor and No. 10 Compressor.

This has been achieved as follows:—

A twenty-five horse power motor running at 700 revolutions per minute, is belted direct on to each of the three compressors, while the three brine circulating pumps are each driven by an extended pulley on these twenty-five horse-power motors. Thus, we have each compressor and its brine pump driven by a twenty-five horse-power motor, and quite independent, so far as the running is concerned, of either of the other two compressors.

There is an ample water supply; fresh water can be taken either from the town mains or from a well sunk on the premises. If taken from the latter source, a centrifugal pump is used, which pump is driven by a seven and-a-half horse-power motor of the C.E. type belted direct.

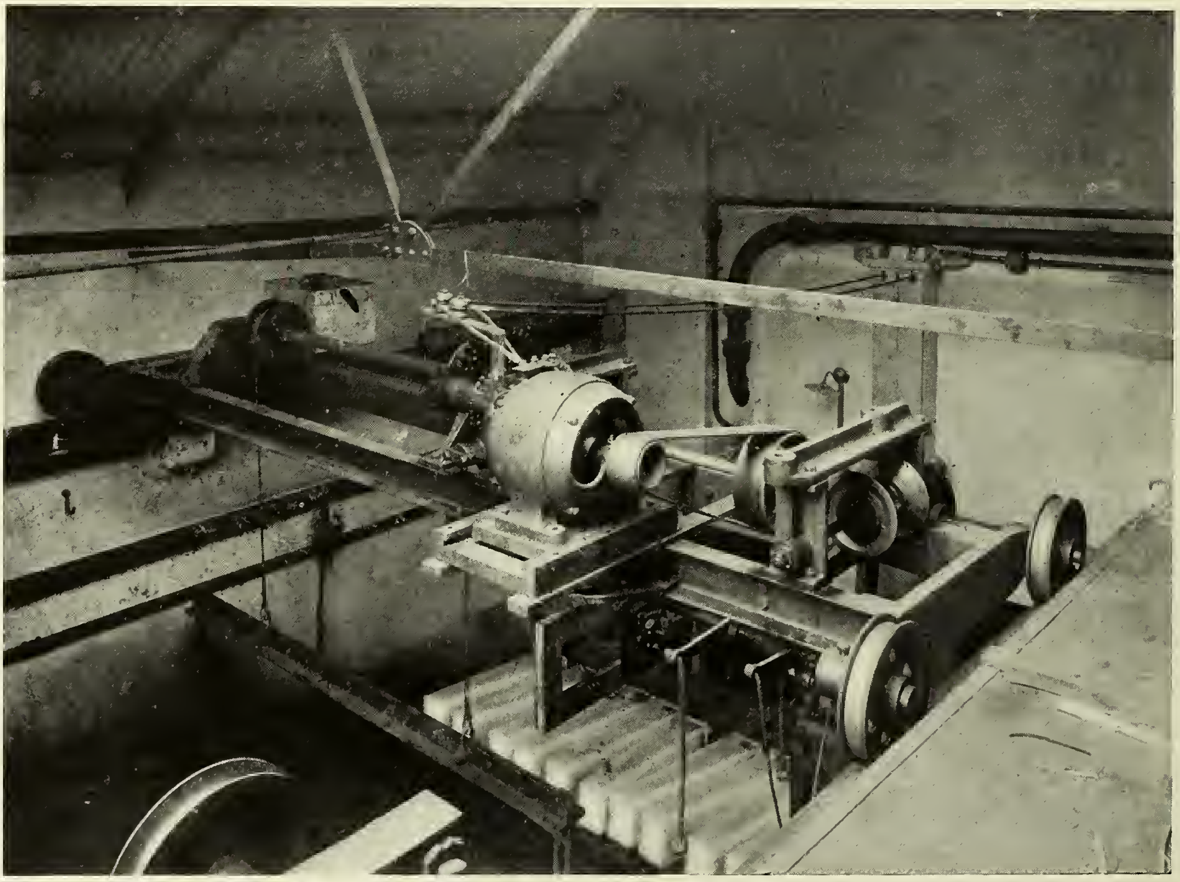
The agitator is driven by a one horse-power motor.

At starting, a travelling crane was driven by a rope gear, which necessitated the use of a very large number of pulleys and a considerable expenditure of power. This has been replaced by a two horse-power motor fixed on the crane itself. The crane is now able either to traverse and to raise or lower simultaneously or independently. The current for this motor is supplied by two steel-centred flexible wires passing over a pulley with counter-weight.

Two motors are fixed upstairs on the second floor—one of seven and-a-half horse-power drives the lift used for conveying goods to the various rooms; the other, a ten horse-power, drives the 60 in. Sturtevant cooling fan.

Corn Beef.—To each gallon of cold water put 1 quart of rock salt, 1 oz. saltpetre, 4 ozs. brown sugar (it need not be boiled); as long as any salt remains undissolved, the meat will be sweet. If any scum should rise scald and skim well, adding more salt, saltpetre, and sugar; as you put each piece of meat into the brine, rub it over with salt. If the weather is hot, gash the meat to the bone and put in salt. Place a flat stone or some weight on the meat to keep it under the brine.

Corn Beef Pickle.—To every 4 gallons of water allow 2 lbs. brown sugar and 6 lbs. salt; boil about twenty minutes, taking off the scum; the next day turn it on the meat packed in the pickling tub, pour off this brine; boil and steam every two months, adding 3 ozs. brown sugar, and ½ lb. common salt. It will keep good a year. Sprinkle the meat with salt before turning the pickle over it. Let it entirely cover the meat, add 4 ozs. saltpetre. Canvas lids are excellent for covering, as they admit the air and exclude flies. Mutton and beef may be kept sweet several weeks by simply rubbing well with dry salt and closely covering. Turn the pieces whenever the vessel is uncovered.



View of Ice Tank with Overhead Travelling Crane driven by Electric Motor.—Cork Cold Storage Co.

Corned Beef.—(American Recipé).—Make a brine strong enough to carry a potato about half out. To the proportion of half a barrel add ½ lb. saltpetre; if pure, you do not need as much. About ten days will cure it; you can tell from the amount of blood in the brine. When cured, change the brine and put in a clean, weak brine to keep it. Corned beef when cooked, the bones removed and pressed in corn beef pans can be sliced and retailed at a good price and be far superior to the corned beef that is sold in ordinary tins.

Corned Beef.—To 100 lbs. beef use 9 lbs salt, 3 ozs. saltpetre, 2 lbs. brown sugar or molasses, 4 gall. water. Boil all together, then skim, and it is ready for use. If to be kept long, add 2 lbs. salt after two weeks in brine.

Corned Beef—(American Recipé).—

100 lbs. beef.
3 qts. ground rock salt.
4 lbs. sugar.
4 ozs. saltpetre.

Mix well. Rub each piece of meat with the mixture, pack close and press hard. Beef prepared in this manner makes its own brine, and will be fit for use in three weeks, and will keep the year round by re-packing and boiling the brine in July.

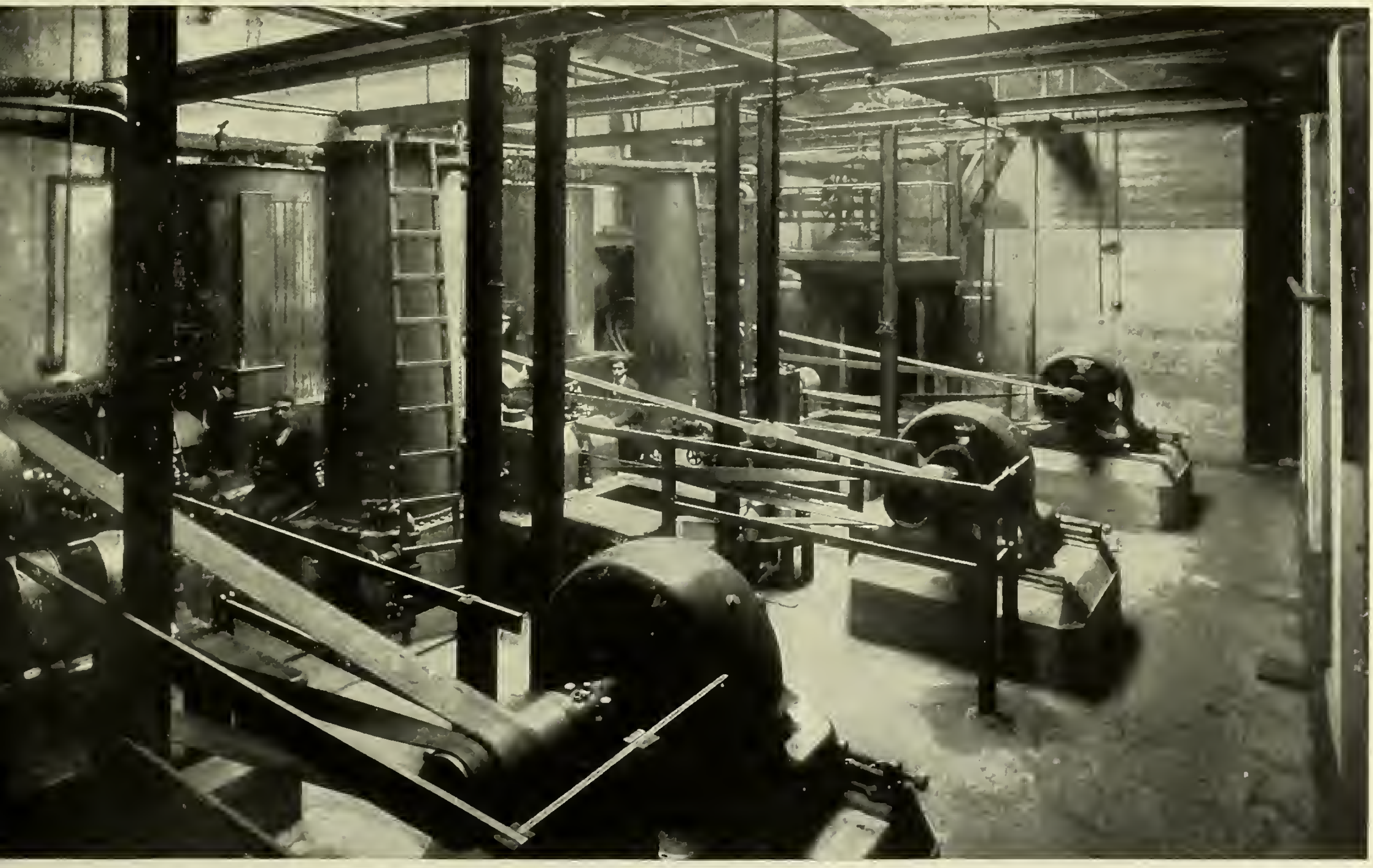
Corned Beef.—(English Method).—Dissolve 112 lbs. salt in 25 galls. water. Skim well to remove scum, and test for strength, which reduce by diluting with water till 75° is registered on salinometer, then add $1\frac{1}{2}$ lbs. saltpetre, $1\frac{1}{2}$ lbs. Douglas's antiseptic, 6 lbs. moist sugar, $\frac{1}{2}$ lb. black pepper shotts, $\frac{1}{2}$ lb. Jamacia pepper shotts, $\frac{1}{4}$ lb. coriander seeds. Briskets and flat ribs should be immersed in this pickle 14 days, rumps, 21 days, and rounds, 21 to 28 days according to size. This pickle turns out choice flavoured meats.

Boil, skim and let it stand till cold. (Dissolve the saltpetre and add to the pickle when cold.) Pack the meat and pour the pickle over it when cold.

Corn Flour.—Corn flour is prepared from the finest portions of maize. It was first manufactured in this country about fifty years ago, although previous to that time it had been largely made in the United States. From the name given to this article it might be supposed that it is the flour of the cereal in the same sense that wheat flour is of wheat; this, however, is not so, as will be seen from the following analysis.

Analysis of Corn Flour.

Starch - - - -	86·78	per cent.
Nitrogenous matter - -	2·15	,,
Mineral - - - -	·51	,,
Moisture - - - -	10·56	,,
Total - -	100·00	,,



View of Engine Room showing three 25 H.-P. Electric Motors driving three No. 10 CO_2 Compressors.—Cork Cold Storage Co.

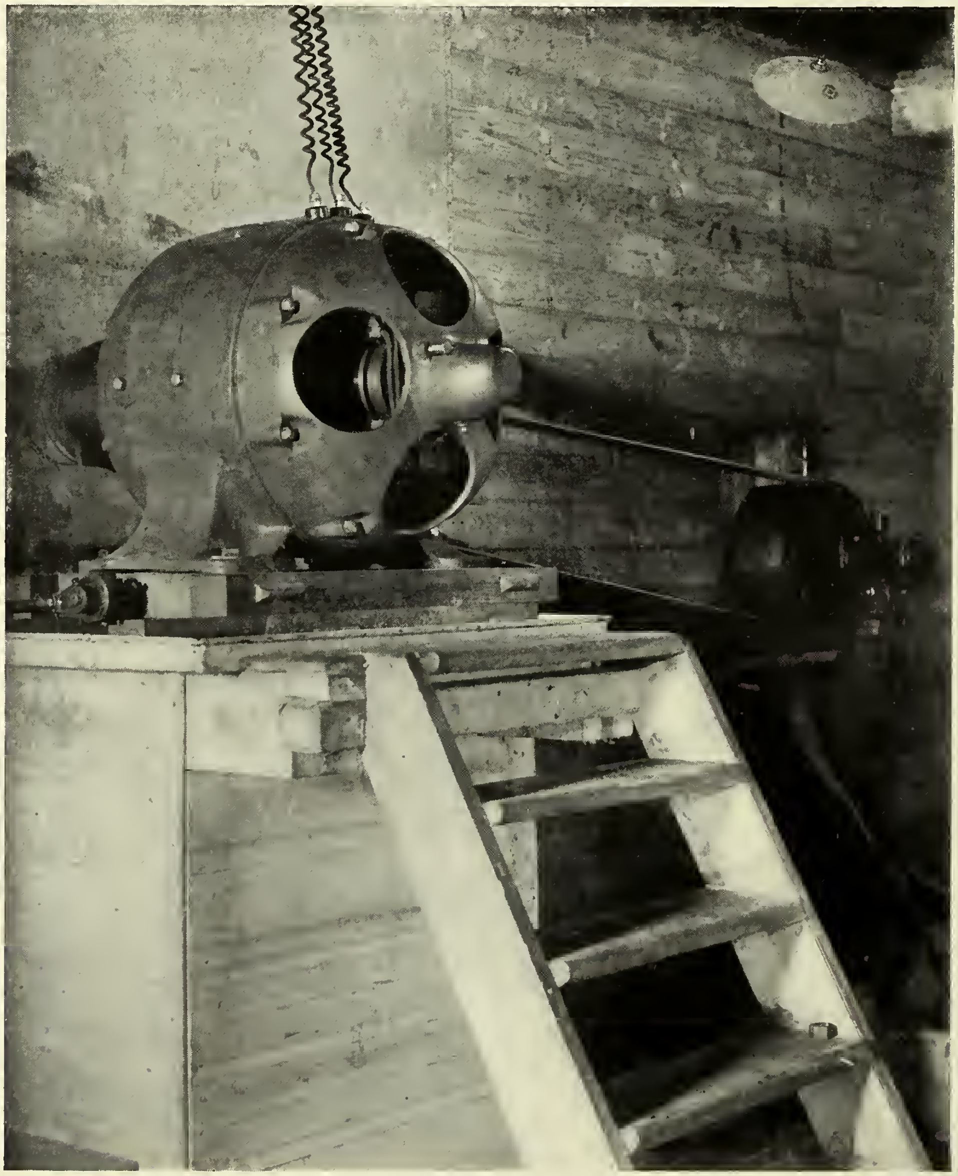
Corned Beef, Spiced.—see Spiced Corn Beef.

To Corn Beef, Pork, or Hams.—(American Recipé).

Take 100 lbs. meat.	3 lbs. brown sugar.
6 galls. water.	1 qt. molasses.
9 lbs. salt.	6 ozs. saltpetre

It will be apparent from the foregoing analysis, that corn flour is almost entirely a starch preparation, but prepared with milk it furnishes a food at once agreeable to the taste, and easily digested; possessing the heat-producing and tissue-forming elements both so essential for the nourishment of the young. A description of the method of manufacture may prove of interest. The corn as it arrives at the mill is

cleaned, and elevated into vats which are filled with water, and there it remains until the gluten is properly dissolved. It is then ground between burr stones. The gluten is separated by a series of sieves, and along with the husk forms an important article for feeding cattle, and is sold under the name of feeding meal. The starch then flows into a system of inclined planes on which it settles, and the finest portions are thereafter treated in tuns so as to get rid of all impurities, and is then put on the market as corn flour.



View of "Cooler" with Motor driving Circulating Fan.—Cork Cold Storage Co.

It will be apparent from this description that corn flour can be made in various qualities, and the firms who have a reputation to sustain only use the finest parts of the starch settlement above referred to for their well known brands. The result of using the lower portions of the starch which settles in the inclined planes, is that the starch is allied with a certain proportion of the fine gluten, and on this account is not so suitable for many of the purposes to which corn flour is now applied. Introduced at first as a preparation for puddings, custards, and blanc manges, the uses to which corn flour is now put are so numerous and varied as to be almost incredible. There is scarcely an article of food which we eat of which corn flour does not form a component part. We have it in our cakes and pastries; in our soups and beef-tea; in our vegetable sauces and gravies. We see it in the pickle-bottle, and it is disguised in the succulent sausage. It appeals to us in the winter season in the cup of cocoa or boullion, and equally in the heat of summer as an ingredient in the cooling ice; and in the manufacture of confectionery and chocolates its utility is readily granted. It will thus be seen that the difficulty does not lie in enumerating the articles of food in which corn flour does not take a place, but rather in mentioning those in which it is not to be found. The manufacture of corn flour in this country has become almost entirely localised in the Paisley

district; and from the large manufactories of Brown & Polson and Wotherspoon the well-known yellow packages are sent throughout the United Kingdom, and all over the world. Various calculations have been made as to the number of boxes of corn flour it will take to reach the North Pole; but certainly no expedition would be considered complete without a plentiful stock of this article.

Corning Pieces.—The pieces generally used for corning are the palate, navel, brisket, and top or sirloin which have the fat mixed through them. The rumps, edge bones, and rounds are also corned and preferred by many on account of their leanness and the delicacy of the outer fat.

Cornish Hogs' Pudding. — The following is the recipé for making these:—

20 lbs. pork.
6 ,, bread.
2 oz. pepper (white).
6 ,, salt.
½ ,, thyme (rubbed).
½ ,, parsley ,,
¼ ,, nutmeg.
¼ ,, antiseptic.

For larger or smaller choppings, the proportions above to be increased or decreased, on basis given. The pork used should be in the proportion of 2 lbs. lean to 1 lb. of fat, chopped fine, and filled into beef middle guts, tied up in sizes about 1½ lbs. to 2 lbs. each. Cooked for forty-five minutes at temperature 170° F.

Cornish or Devonshire Hogs' Puddings.—

16 lbs. lean pork.
6 ,, fat pork.
2 ,, sausage meal.
3 ,, scalded rice or bread.
1 ,, corn flour.
1 ,, water.
12 oz. seasoning (as below).
Add 4 eggs when chopping.

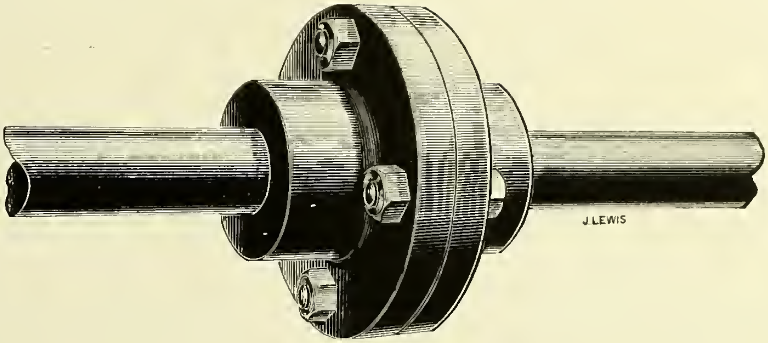
Seasoning—

6 lbs. white peper (No. 2 super).
9 ,, salt.
1 oz. cayenne.
½ ,, mace.
½ ,, rubbed thyme.

Method of Preparation.—The whole mixture is chopped finely and filled out in wide pig's casings, or fat ends, or bullock's middle casings. Simmer for half-an-hour in water at 180° F., then plunge into cold water, and allow it to run over them for twenty minutes or so—until they are quite cold. For the purpose of handling them, it is advisable to have either a wire basket or a fish cooker, so that they can be lifted out of copper and dropped into cold water instantly without risk of breaking. The colour ought to be pale and almost white.

Counter Weighing Machine—see Weighing Machines

Couplings.—Flanged rings for fixing to the ends of pieces of shafting for the purpose of connecting them into a continuous line. The couplings are in the first place keyed to the shafting, then bolted together as per illustration.

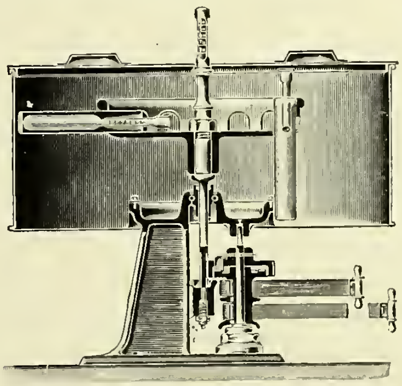


Flanged Couplings.

Cow Heels.—The feet of oxen prepared as follows: cleanse in cold water to remove all blood and impurities, and scald in water at a temperature of 150° F., when the hair can be easily removed. After which immerse for fifteen minutes in boiling water and remove claws, then boil till tender.

Cramping Hooks.—see Hooks.

Creamery Result.—The systematic testing by means of the butyrometer of all milk, as also the tabulating in a systematic way such information together with all other



Butyrometer.

information of a technical character, should form a feature in every creamery. A table illustrative of actual results is given on next page with a view to shewing the kind of information which is of value.

Crystal Roseine or magenta acetate is an aniline dye made from coal tar products. It has a rich red purple colour, and has great tinctorial power. It is used for dyeing the skins of sausages, but mostly in combination with other dyes, especially with bismarck brown. It is sold either in crystal or in powder, and is commonly put up in square tins holding a pound.

Culinary Herbs, etc.—Under this heading occur numerous plants, leaves, seeds, and fruits, which are employed for flavouring and adding relish to our daily food. The properties to which, medicinally, may be attributed their value are for the most part aromatic essential oils, which are held in high esteem by the profession as an aid to the digestive organs, and principally to stimulate the work which the stomach has to perform in its function of dissolving the foods which are required for the nourishment of the body and the renewal of the blood.

Summary of Creamary Returns.

No.	Average Produce :— Ounces per Gallon.	Average Produce :— Percentage of Butter Fat.	Average Test	Percentage of Butter Fat unseparated or lost.	Gross Value of Milk per Tables.	Working Expenses to be deducted from Gross Values.	Net Value of Milk (without profit) per Gallon.	Average Price Paid for Milk per Gallon.	Average Price of Butter per lb.	Percentage of Working Expenses (on Sales).
					PENCE.		PENCE.	PENCE.	PENCE.	
1	6.72	3.48	3.70	0.22	4.33	0.43	3.90	3.86	10.42	10.63
2	6.82	3.53	3.72	0.19	4.61	0.44	4.17	4.04	10.82	10.45
3	6.75	3.50	3.75	0.25	4.51	0.51	4.00	3.94	10.69	12.16
4	6.62	3.43	3.58	0.05	4.52	0.42	4.10	4.10	10.91	8.92
5	7.02	3.64	3.85	0.21	4.51	0.49	4.02	3.85	10.30	10.72
6	6.58	3.41	3.68	0.27	4.22	0.44	3.78	3.65	10.24	10.64
7	6.90	3.57	3.75	0.18	4.38	0.47	3.91	3.70	10.15	10.81
8	7.04	3.65	...	...	4.44	0.48	3.96	3.84	10.12	10.98
9	6.63	3.44	3.62	0.18	4.35	0.47	3.88	3.76	10.50	11.06
10	...	...	...	...	...	...	...	...	...	...
11	6.94	3.59	3.80	0.21	4.60	0.42	4.18	3.98	10.61	9.40
12	6.84	3.54	3.91	0.37	4.64	0.37	4.27	4.06	10.86	8.03
13	6.70	3.47	3.75	0.28	4.35	0.50	3.85	3.80	10.39	11.58
14	6.98	3.62	3.90	0.28	4.40	0.44	3.96	3.78	10.08	10.34
15	6.91	3.57	3.83	0.26	4.70	0.47	4.23	4.02	10.61	9.90
16	6.46	3.35	3.50	0.15	4.42	0.49	3.93	3.91	10.94	11.13
17	6.69	3.46	3.80	0.34	4.45	0.44	4.01	3.86	10.40	9.86
18	6.63	3.44	3.65	0.21	4.35	0.43	3.92	3.79	10.26	10.10
19	6.81	3.53	...	...	4.28	0.51	3.77	3.62	10.06	12.14
20	6.96	3.60	3.80	0.20	4.60	0.51	4.09	3.94	10.31	11.22
21	6.74	3.49	3.70	0.21	4.29	0.49	3.80	3.69	10.20	11.63
22	6.86	3.55	3.86	0.31	4.49	0.45	4.04	3.88	10.48	10.12
23	6.79	3.51	3.78	0.27	4.35	0.47	3.88	3.64	10.25	10.82
24	6.68	3.46	3.64	0.18	4.43	0.48	3.95	3.76	10.35	10.74

The herbs chiefly of interest to our readers are to be found widely spread throughout Southern Europe and Northern Africa; many of them are indigenous to this country, but for purposes of commerce are not sufficiently plentiful in the wild state, and too costly in cultivation, to compete with the foreign grown produce. The neighbourhood of Nimes-Grasse, and indeed the whole of Southern Provence is rich in all kinds of aromatic herbs; and travellers tell us that the wild tracks of desert in Northern Africa are perfumed by the aroma of lavendar, rosemary, and thyme, and every kind of sweet smelling flower, which grows in such profusion in Morocco and Algeria, the smell of which is borne by the wind for miles across the desert.

For commercial purposes the culinary herbs are chiefly used "rubbed," *i.e.*, the fresh plants cut just before they bloom, are first dried artifically or in the sun, and afterwards rubbed by hand to separate from stalks. Merchants tell us that owing to facility for adulteration, great discrimination and knowledge of markets is needed to protect themselves in their purchases.

The following are the herbs most commonly met with :—

Basil.—Thought to have come originally from the East and much valued for its sweet perfume. It derives its name from a Greek word designating "royal," and points to the probability of its high esteem by the ancients who named it, to signify its worthiness to be used by kings. It is said to have entered into the perfumed baths and ointments so much appreciated in ancient days.

Celery Seed.—Although commercially known as "seed," is really a fruit obtained from a biennial plant largely cultivated for trade in Provence and of late years in the United States. It is allied botanically to parsley, belonging to the order of Umbels. It is found wild in England in ditches and meadowlands, but in this state is unpleasantly acrid in taste and somewhat poisonous. Under cultivation it develops tuberous roots which are eaten as food. The "celery" in so much favour in England with dessert is the stalks of the same plant artifically bleached by excluding the light with heaped up earth.

Bay Leaves.—The leaves of the *Lauras Nobilis*, the *Noble Laurel*, or *Sweet Bay*. It is the Classic Laurel used by the ancients to crown their heroes and called therefrom "the Victor's Laurel." It is probably the ezrack or green bay of Holy writ. The plant contains a strong volatile oil and also a fixed fatty oil, the latter being extracted chiefly from the fruit or bay berry. The leaves are much esteemed by cooks for their aromatic properties.

Marjoram.—In the wild state this favourite cooking herb is to be found throughout Europe, Asia, and North Africa. It is perennial in growth and contains a large amount of essential oil, much esteemed for its use as an external stimulant in veterinary medicine. For domestic purposes, the plant is cultivated (chiefly in Provence), and imported to this country, either in bunches or else rubbed off the stalks. It is also now largely cultivated in America.

Mint.—This name, of Greek origin, is used to designate a very large number of species indigenous to the Northern temperate regions. The three following, interest us most :— 1. Peppermint largely cultivated in England for the essential oil, especially at Mitcham in Surrey; 2. Spearmint, sweet or garden mint, so much appreciated in our kitchens; 3. Pennyroyal which is less known in cooking, but is none the less employed largely in flavouring manufactured meats, and is considered a great aid to digestion. Medicinally it was formerly much used and is even now appreciated as an emmenagogue.

The mints are perennial plants and belong to the order labiatœ, the charactistics of which are lip-shaped flowers. In most cases this group has reservoirs of essential oils.

Parsley.—This, like celery, belongs to the largely distributed umbel bearing order (so called from the shape of the flower). The parsley plant is very extensively cultivated for

cooking purposes, and the so-called curled parsley is especially sought after for culinary decoration. A large market garden trade is done in it throughout England. Parsley in the rubbed state is chiefly imported from Northern Central Europe, a certain degree of cold being required to bring the colour and flavour to perfection. The parsley plant is analogous to the fennel, caraway, parsnip, chevril, and other excellent umbels.

Rosemary.—Another of the lip-shaped flower group, and allied to the mints, is a stiff bushy plant very widely distributed throughout Europe. It is largely cultivated round about Narbonne, where the air is laden with its perfume. The Narbonne honey derives its special flavour from being drawn from the rosemary flowers. The chief use in commerce for rosemary is in the perfumery and hairdressing trade. Medicinally it is a strong nerve stimulant, and was esteemed by the ancient Greeks and Romans for its reputation as a strengthener of the memory. In food it is employed for flavouring certain made up meats.

Sage.—This is perhaps the most widely known of cooking herbs, and forms a staple market garden industry in England. For commercial purposes it is imported extensively from Austria, Hungary, and Northern Italy where it grows wild in great profusion. It used to be much taken as a medicine in the form of tea, and in country districts is still esteemed as a cure for sore throats. A variety known as red sage is specially rich in astringent properties, and is sold by herbalists as a throat remedy.

Savory.—This is a common herb in our kitchen and is of two kinds, the garden or summer savory, an annual plant, and the mountain or winter savory of heavier growth. In certain countries savory is esteemed as a remedy in intermittent fever. Botanically it belongs to the lip-shaped group, and is imported from the Mediterranean district.

Thyme—In culinary art there are two kinds of thyme employed, the common garden thyme and the wild or lemon thyme. Indigenous to Southern Europe, it is also cultivated in America and the East. It yields an essential oil known as oil of thyme, of similar uses to oil of origanum, for which it is frequently substituted. Its oil is not used much outside veterinary medicine, but is considered to be, in addition to a strong local stimulant, an excellent disinfectant. Thymol obtained from the oil is used for surgical dressings in the same way as carbolic acid.

In the middle ages the art of healing and the knowledge of plants was almost entirely confined to the church, and we have a remnant of this in the liqueurs known as chartreuse and benedictine, the former of which is still made from a secret receipt held by the monks of the Grande Chartreuse or Carthusians, and which is distilled from a number of aromatic herbs. Benedictine liqueur, now in the hands of a company, had a similar origin in the benedictine order.

Cumberland Bacon.—In Cumberland, they simply lay down a body of salt on a clean stone floor and lay the sides, etc., in it, and throw more on top and lay the hams so that the thin end is downwards; it is mainly salt though they use about 1 lb. of saltpetre to each pig. The meat is turned three times within the first week and then left quiet in the salt for another fortnight, after which, it is lifted, washed, hung up, and ready for sale then or anytime thereafter. At home in a small way where a poor man cures his own pig that he has fed himself, he bestows more cure upon it, rubbing the pickle carefully in, etc. But there is more in the feeding than in the cure.

Curing Bacon in Summer.—*Rules for Pork Purveyors.*—It is a mistake to suppose that when the warm weather sets in the ordinary curer of bacon must cease operations, and allow those of the more favoured sort who possess powerful refrigerators to rule supreme. Undoubtedly there is great difficulty in handling pork during sultry weather. The risks, however, of spoiling it during the cure can be much minimised by attending to a few simple rules. Eight score to ten score pigs are most suitable for bacon, heavier pigs for hams and broad-cut sides. Before slaughtering, it will be found necessary to rest the animals for about twelve or fourteen hours, more especially so if they have come a long journey. During the period of rest no food should be given them, as otherwise the digestive organs are set in full motion, and the animal heat produced is sure to make the cure impossible. The most humane method of slaughter is to knock down with a round-faced mallet, thus producing insensibility, then string the animal up to a sliding bar and let out the blood. The state of insensibility prevents the struggling, which in hot weather is so much to be guarded against, as well as preventing the screams of the dying animal from becoming a nuisance. Amongst many appliances of use at this stage of the proceedings, none is more useful than the singeing furnace. It may be made of bricks and heated with coke, or of a simple gas arrangement. It either case the effect to be produced is to burn the hair of the animals into a black crust, and harden the rind; at the same time to produce that delicacy of flavour which is wanting in pigs that are only scalded. When the singeing is completed, throw some buckets of cold water all over the carcase, and immediately scrape off the black crust with a flat-faced scraper. From this stage onwards to the cutting up into sections a copious supply of clean, fresh cold water should be at hand and freely used. Open the carcase and remove the intestines, cut off the head, split down the back so as to separate out the vertebral column, and divide the two sides. It is best to allow of complete setting by permitting the sides to hang in a cool draught for some hours, say all night, and proceeding thereafter to trim and prepare for the cellar. Trimming the sides is a very simple process, and is more a question of practice than anything else. The spare-rib should be cut out, the ribs cleaned, the blade-bone removed and symmetry obtained. Be careful also to remove the large vein just beneath the spare-rib, as the clotted blood, if left about, is exceedingly dangerous. The sides would now be ready for the cellar.

A cellar such as can be cheaply used for curing during warm weather may be constructed as follows: The basement of a shop or house is made perfectly air-tight by lining the walls with cement, and the roof with feathered and grooved boarding. The floor is divided into sections, and right round the wall is erected, at a height of 2 ft. from the floor, a table of stone or brick of a width of about 3 ft. 6 in., and gently sloping *inwards*, so as to provide a channel for the brine. In the centre a table is erected of similar height (2 ft.), and with a slope from both edges to the centre, so as to provide a brine channel. These tables should all gradually *fall* in the direction of the pickling tanks, which may be as numerous as circumstances will permit. A very convenient size for these vats is 4 ft. deep by 3 ft. 6 in. square, and they

can be constructed of either slabs of slate or of Caithness flagstones cemented or bolted together. Caithness flagstones are also very often used for the tops of the tables already described. In a recess, if possible, just above the pickling vats, or at any rate at the end of the cellar furthest from the doorway, a box for receiving ice should be constructed. The size will depend on the space to be cooled. Thus, for a cellar 30 ft. by 20 ft., a box holding half a ton of ice will be sufficient. It must be borne in mind, however, that the greater the quantity of ice present, the proportionate loss by waste will be the less. The ice box should have a false bottom and convenience for collecting the water produced, and the sides nearest the cellar should also be constructed of lattice pattern, so that the cold air will fall outwards freely. The cold air will fall *downwards*, so that it is necessary for the ice box to be as near the roof as possible. The place for filling the ice into this receptacle may be conveniently put immediately above it, and the entrance secured so as to prevent a large influx of air. It is necessary to allow of the entrance of a little air, as will be explained below, but the air capable of being drawn through a 2 in. tube is quite sufficient for almost any ordinary cellar. Near the doorway, and at the opposite end from the ice box, a small fan of about 12 in. or 18 in. diameter should be fixed in the wall and connected with a water motor or small gas engine of about two-man power. As the fan may have to travel constantly, it is perhaps desirable to use a water motor as the more reliable and less dangerous of the two. When these arrangements are completed, the action to be produced is as follows: The fan causes a gentle current throughout the cellar, and draws its supply of air *through* the ice box which must be very cold, and thus disseminates over all the space an equal temperature of about 50° Fahr. It may be easily reduced to 45° by carefully proportioning the fan and the ice box to the cubic capacity of the cellar. From 45° to 50° Fahr. are the temperatures between which curing may be conducted successfully.

Having thus obtained the convenience required at a very moderate outlay, the fresh sides should be taken and laid on the table near the doorway and *pumped*—that is to say, brine of the following composition should be injected into all the lean or solid parts and along the sides of the bones of the hams—

Brine for Pumping Bacon.

55 lbs. salt.
5 ,, food preservative (dry antiseptic).
5 ,, Egyptian or Barbadoes sugar.
5 ,, Saltpetre.

Make this up to twenty gallons with fresh cold water, and stir till all is dissolved. Should it prove to be thick and muddy, boil and skim till clear. Pump this brine by means of a brine pump or hand brine syringe into the bacon, as described, and thereafter dust the side with a little food preservative (dry antiseptic), and rub the inside well with fine salt to which has been added five per cent. of saltpetre. Lay a bed of salt on the table and cover up the side with it. The same process is gone through with all the sides, and if there be not space enough to lay them out singly, pile one on the top of the other, always taking care to have plenty of salt between. At the end of the third day remove the salt and turn the sides, if piled, so that those at first on the bottom will be on the top, and add fresh salt with a little rubbing. At the end of eight or ten days the cure will be complete, and the sides may then be removed altogether from salt, washed in cold water, and hung up to dry. Dust some food preservative into the "pockets," and sprinkle a little corn sharps, finely ground, over all the inside. If the bacon is required smoked, dust the sides all over with fine ground Canadian pea meal, and hang up in the smoke house for about thirty-six hours. A much less time (about twelve hours), will do if there is a full volume of smoke Oak sawdust is the best medium for smoking, producing the richest flavour. By the foregoing simple and economical plan prime bacon, finely flavoured and commanding high prices, can be produced. There are details in the construction which of course cannot be dealt with here, but the main idea will be easily grasped by our readers.

Curing Beef.—The same method practically obtains in curing beef, and the same pickle is used as for curing tongues. The only difference is that the beef is pumped all over before it is thrown into the pickle.

Curing Fat Pork.—see Pork.

Curing Hams.—The general conditions under which hams may be successfully cured may be stated as follows:—

1. The fresh hams should be chilled to a uniform temperature of 38° Fahr.

2. The curing cellar should have a constant temperature varying between 40° and 42° and should be humid.

Primarily it may be stated that there is some disadvantage in collecting hams at a distance from the curing factory, inasmuch as in warm weather there may be some of these of high temperature and predisposed to taint. That difficulty may be minimised by instructing the consigners of the hams to press out the excess of blood from the blood vein, and to dust the hams over with food preservative (dry antiseptic). When the hams are received they should all be pressed to see if any excess of blood remains in the blood vein. If there is any pressed out, it should be wiped off with a damp cloth, which has been soaked in a solution of 1 lb. dry antiseptic and 1 gallon of water.

The hams should be hung up in a chill room where there is a constant circulation of dry air, and the temperature of the room should not be allowed to exceed 38° Fahr.

The time which the hams are allowed to hang in the chill room must be regulated by means of the meat testing pocket thermometer. This little instrument is pressed into the ham and the temperature read off.

As soon as the hams are sufficiently chilled, they are nicely trimmed and shot down into the cellar, never getting into the outer atmosphere again until they issue cured.

The hams are at once plunged into a pickle formed as follows:—

Recipé for purging pickle for Hams.

Take the following quantities—

55 lbs. salt,
5 ,, saltpetre,
5 ,, dry antiseptic,
5 ,, pure cane sugar,

and add suffiicent water to make a total bulk of twenty gallons. Stir all together and wait till all is dissolved. Allow to settle, and when clear, decant off the liquor into pickle tanks in cellar. Another way of treating this liquor so as to clarify it is to boil it till clear.

The liquor, however made, is run into the pickle tanks which are made of a convenient size and placed in the cellar. The pickle should be allowed to remain there until on the floating thermometer it registers 40° to 42° F. The density should be about 100° on salinometer.

Plunge the hams into this pickle, and keep them down beneath the surface by means of a hard wood grating on which stones or weights are placed. Take the hams out the following day after they have been put in, and squeeze them so as to rid the blood vein of final traces of blood.

Immediately then, lay the hams on cellar floor or on slate or flag stone shelving, which may be also used in cellar. Put a bank of salt about four inches high along the line where hams are to be laid, and place the thick end of ham rind downwards, on this bank pointing the shanks downwards. The shanks should touch the floor. The hams should be laid down symmetrically all in line and with the shanks at equal distances apart and pointing diagonally to the bank of salt.

When one line is complete, lay a long lathe of hard wood on shanks, and fill the spaces with salt, then proceed as before. This process is carried out until each day's hams are laid down. Each day's hams should be kept separate in a square or section by themselves, and a lane provided between them and other day's hams. A tally bearing date and other particulars should be placed on each section.

When the hams are being laid down in the way described, each line should be salted in the following manner:—

Prepare an equal mixture of dry antiseptic and granulated saltpetre, and sprinkle this mixture lightly with a horsehair sieve all over the cut surfaces of the hams. Take an extra pinch of the mixture and press it into the blood vein opening. Now cover the whole over with fine salt—a layer of half-an-inch at least is necessary.

This treatment should be followed with each row of hams. The remainder of the process of curing must be regulated to a large extent by judgment.

If the hams are averaging 14 lbs. in weight, they may be taken out of salt in fifteen days from date of putting in. These hams will be mild cured and must be consumed immediately. If, however, keeping hams are wanted, then 14 lb. hams will require twenty-one days for the cure, and many people would keep them thirty days. It depends altogether on the market to be supplied. The old fashioned farm cured York ham would be allowed to remain in salt thirty days if 14 lbs. in weight.

For modern curing it is safe to say that 1 lb. in weight requires one day in salt to cure for hams for immediate comsumption. But where hams are to be kept until they develop a "bloom," then two days per lb. weight is the rule to follow.

When the hams are cured they are taken up and washed in luke-warm water and then hung up in a drying room kept at 85° Fahr. to dry. About two to three days will be sufficient length of time required for drying, but this again is a matter of judgment. To make pale-dried hams look *white*, plunge them for a few seconds in boiling water (212° Fahr.) and then proceed to dry them.

If the hams are wanted smoked, then they are hung up in a properly constructed smoke-stove, with the heat capable of being regulated. This regulation is affected by means of steam gilled pipes. The temperature of the smoke-stove should not exceed 90° Fahr. The smoking material may consist of any hardwood sawdust. This is spread over the floor of stove and lighted either in centre or at four corners. In Ireland, peat is frequently used for smoking. It gives a rich flavour much appreciated by connoisseurs. Smoking requires generally about three days. To put the final gloss on smoked hams rub the skin well with a cloth on which there is some vaseline.

Curing Hams—(American Recipé).—Allow the hams to hang for a week or ten days until tender (they should hang as long as possible provided they keep perfectly sweet). Use for each ham, one tea-cupful of salt, one table-spoonful of molasses, one ounce saltpetre.

Lay the hams in a clean dry tub; heat the mixture and rub well into the hams, especially around the bones and recesses. Repeat the process once or twice until the mixture is all used. Let the hams lie two or three days, then put them in brine (strong enough to bear an egg) for four weeks, after which wash in hot water and dry for twenty-four hours. Smoke from three to five days over a slow fire, being careful not to heat the hams. Hickory wood and sawdust is the best for flavour and colour. If it can not be had, use any other hardwood. Tie up carefully in bags for the summer.

Meats that are pretty far gone can often be sweetened by washing several times in clean cold water, and while they are in the last bath throw in several pieces of red hot charcoal; this sweetens them for the time being, but they should be cooked immediately afterwards.

Parboiling sometimes freshens up meats if they are not too near spoilt.

Curing Tongues.—The tongues must first of all be cooled before it is attempted to cure them. They should not be put into the pickle for curing if they register on the meat thermometer a higher temperature than 55°. If they are put in at a higher temperature, the possibility is that they will be tainted. Prepare a pickle of the following constitution:—

55 lbs. salt.
5 „ saltpetre.
5 „ pure cane sugar.
5 „ Douglas's preservative.

Add sufficient water to make the total bulk up to twenty gallons. Boil this solution, stirring it all the time until it is clear; as the scum rises to the surface, remove it. Now put this pickle into an oak pickling tub and keep it nice and clear. Before the tongues are put into the pickle, a long pump needle should be inserted right down the centre and some of the pickle pumped into the centre of the tongues. To add additional flavour, it is customary to make up for every twenty gallons of pickle, a cotton bag into which has been placed 1 lb. juniper berries, 1 lb. corianders, 1 lb. bay leaves. Let this bag float about on the top of the pickle so that the contents will be extracted. The tongues will be mild cured in seven days. Of course they may be taken out before that time, or if it is an advantage, they will not take very much harm by being kept any longer time in the pickle.

Curing Ox Tongues.—*To 10 gallons of water add:—

3 lbs. cane sugar.
12 ,, salt.
$\frac{1}{2}$,, saltpetre.
$\frac{1}{2}$,, dry antiseptic.
$\frac{1}{2}$,, bruised Jamaica ginger.
2 ozs. bruised cloves.
$\frac{1}{2}$,, bruised pepper corns.

The pickle should be boiled and skimmed till clear and should indicate 98° on salinometer. If it does not indicate that density add pure salt until it does. If it is stronger than 98°, reduce with water that has been boiled.

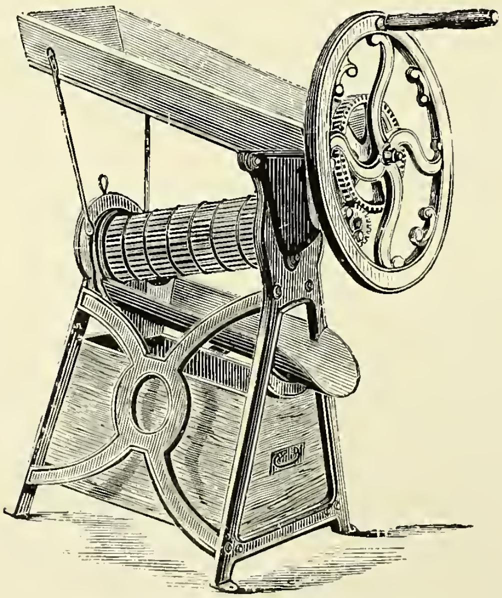
The ox tongues should be quite fresh and free from slime. They should, if possible, be chilled to 38° Fahr. before curing is attempted, but that temperature is not attainable except in winter or where a refrigerating machine is kept.

The tongues should be rubbed with a little fine salt so as to free them from slime, and the needle of the pickle pump should then be stuck two or three times into the roots and *once* down the centre from the root end.

Immediately afterwards throw the tongues into the pickle and weigh them down with stones or weights on perforated oak boards. Leave them in pickle seven days and then remove the bag containing the ginger, cloves, pepper corns, and it may be also bay leaves. Bay leaves are not essential but give a very nice flavour.

The tongues are really at the end of the first seven days, in pickle, mild cured and are then very tasty and sweet, but the majority of people will have them well cured and fairly salt; therefore, after having removed the bag with the condiments, leave them again for other seven days. At the end of that time they will be cured perfectly.

It is well to re-boil the curing pickle often. It gets thickish with blood and other animal matter and so is likely to taint the tongues. But this can be avoided by boiling and skimming till clear. Always keep the density at 98° on salinometer.



Currant or Fruit Cleaner for Hand Power.

* NOTE.—The bruised ginger, bruised cloves, and bruised pepper corns should be put into a thin cloth bag, put into the brine and allowed to float about in it, a handful of bay leaves may be added to the bag with advantage.

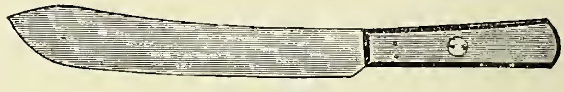
Currant Cleaner.—A machine for removing the sand and grit, etc., from fruit and especially currants. The fruit as imported is placed in the hopper and works its way down through the revolving screen forming the middle part of machine; the rubbing on the wires of which cleans the fruit. The dirt, etc., falls into the under shoot and may be caught in a box or pail in front, while the fruit falls through a small hopper at the back of machine into the movable box below.

In large factories or wholesale houses, these machines are of large capacity and driven by steam, gas, or electric power.

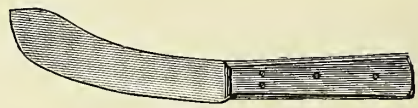
Cutlery.—Good cutlery is a desideratum in every shop. There are of course many makers and many prices, but it is a safe policy, to adopt, to buy only from a house of repute, who will do their utmost to prevent anything but the best articles from getting into the hands of their clients. The usual shapes of knives for general use are as per illustrations—

Boning Knife

Sticking Knife.



Butchers' Knife.



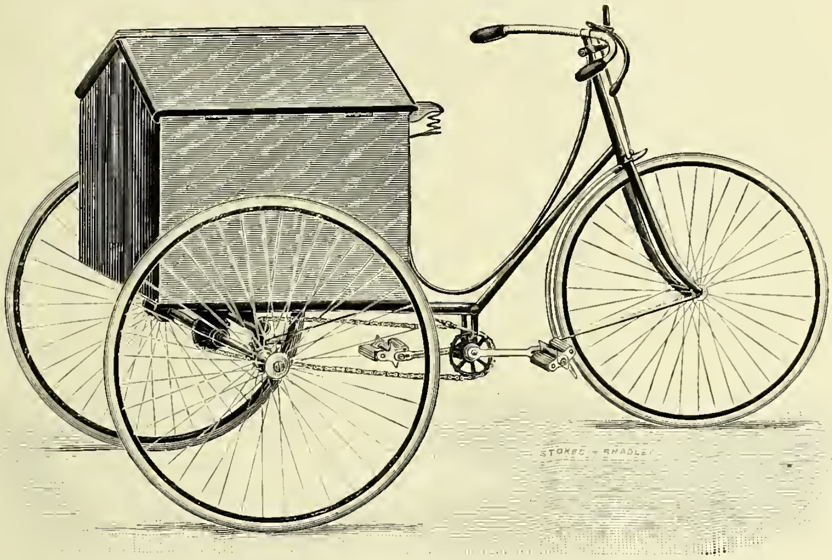
Skinning Knife.

Beef Slicer.

Ham Slicer.

Steak Knife.

Cycle Carrier.—Light carrying vans mounted on ordinary tricycle wheels with pneumatic tyres and capable of being propelled by a lad. They are exceedingly useful for shopkeepers who do a family trade, as a strong lad will often do as much with one of these carriers, as can otherwise be done with a pony and van. There are many varieties and builds, and no hard and fast rule can be laid down as to which design is the most suitable, as so much depends on the work for which the carrier is employed.



Cycle Carrier.

DAIRY Factories in Tasmania.—see Tasmania.

Dairy Farming in Victoria.—see Victoria (Australia).

Dairy Industry in Belgium.—The co-operative dairy movement in Belgium has become remarkably evident during late years. At the present moment nearly 450 creameries, large and small, exist in that country; amongst these several comprise large industrial establishments which are provided with very extensive plant and produce considerable quantities of butter.

Until quite recently the funds necessary for fitting up these factories were provided either by the farmers themselves or by the landowners in the neighbourhood, who reimbursed themselves for these advances by annual charges. In some districts the farmers even borrowed the money, which they required, to fit up these factories with the necessary plant, from an agricultural bank or from the general savings bank and superannuation funds, giving their personal security for same.

M. A. Collard-Bovy.
Managing Director, Comptoir Central des Grandes Laiteries Belges.

In Belgium, however, as in other countries, the farmers do not like to place their money in industrial businesses. Thus, many of them, although desirous of progressing, are afraid to put their money into these dairy factories. It has therefore been found necessary to find a way of being useful to the farmers without their having in any way to involve their property.

It was with this object that Monsieur Collard-Bovy, agricultural engineer, and manager of the Dairy Schools in Belgium, established the Comptoir Central of the Grandes Laiteries Belges. Having been in close contact with the farmers for many years, he knew exactly what they wanted. With the assistance of several friends he promoted this society, with an initial capital of one million francs, which has now, by the decision of the directors, been increased to two million francs.

Depot and Separating Station at Anseghem.
Comptoir Central des Grandes Laiteries Belges.

The society established a central separating depôt at Anseghem—a place where there was a fairly large number of farmers. The milk supplied by these farmers is taken every day to this separating station, where it is passed through direct-acting steam turbine separators. The separated milk, after being pasteurised, is taken away by the farmers; the pasteurised cream is taken to be converted into butter, to a very large central factory, which receives the cream from one hundred different separating stations, and is provided with very perfect plant, comprising boiler, steam engine, refrigerating machine, dynamo for producing electric light, pasteurising room, fermenting room, cold chambers, churning cellar, butter washing room, laboratory, etc., etc.—in fact, everything needed to render an installation of this kind as perfect as possible.

The buildings, which are designed by M. Ambroise Roy, architect, are constructed with concrete on Hennebique's system, and they are very cool in summer and quite safe from fire.

The method adopted of dividing the work allows of a very considerable reduction of expenses in transport and manufacture. The staff of all the stations is chosen, directed,

and paid by the central branch of the Grandes Laiteries Belges, which undertakes to do the work at the rate of one centime per kilo. of milk.

The society erected last year two butter factories and thirty separating stations, in each of which will be separated daily from 3000 to 5000 kilos. of milk. The company will also erect a good number of separating stations this year.

M. Ambroise Roy, Architect.

Not only is the butter made at the chief factory of the Grandes Laiteries, but here also it is sold according to the request of the farmers. The greater part is usually sent to the market of the Union Laiteries Belges—a company established especially for the selling of butter by auction in wholesale quantities from Belgian creameries, and to which company 175 creameries are affiliated. This society, established two years ago, has met with great

A branch Separating Station.
Comptoir Central des Grandes Laiteries Belges.

success, and the creameries and merchants are entirely satisfied. When the erection of all the stations is completed the Comptoir Central will go in for the export of butter. The Grandes Laiteries, as can be seen, is a very large affair, and without doubt will become one of the most important industries of its kind.

Dairying in Nova Scotia.—see Nova Scotia.

Dairy Produce Imports (United Kingdom).—The report of the Board of Agriculture for 1900, giving the actual figures for 1899 states—

As regards imports of dairy produce the slight decline commented on a year ago has not been continued, and the supply was again greater in every instance except the variable and insignificant item of fresh milk and cream, which has fallen in quantity, but increased in value.

The increase in butter was about $5\frac{1}{2}$ per cent. in quantity, at a value per cwt. slightly higher than it has been in previous years. This increase was, it may be remarked, accompanied by an enhanced importation of margarine. In cheese and in condensed milk the advance was relatively much smaller. Of butter, it may be noted that while Denmark remains very much the largest contributor to our wants, the total supplies from this quarter were slightly less than in 1898, and those from France showed a still more considerable reduction. The advance in butter imports was, in fact, due to the extending trade of the more distant exporters—Canada and the United States on the one hand, and our Australasian Colonies on the other, adding materially to their former exports.

The details of the figures are as follows :—

Butter - -	3,389,851 cwts.	Valued at £26,750,084
Margarine -	953,175 ,,	
Cheese - -	2,389,313 ,,	
Condensed milk	824,618 ,,	
Milk and cream	7,859 ,,	

Dairy Products (United States of America).—Dr D. E. Salmon, chief of the Bureau of Animal Industry reports as follows for the year ending 30th June 1900 :—

The general survey of the condition of the dairy industry of the United States, begun upon the organisation of the dairy division, has been continued, and special inquiries have been made along lines such as the milk supply of cities and towns, and the development of foreign markets for our butter. Some reports have been issued and others are nearing completion.

The routine work of the office, including preparation of manuscripts for publication, and replying to the requests for specific information from many correspondents, is constantly increasing. The publications of the division during the year number five, comprising in all 183 pages. One was issued as a bulletin, one as a circular, one as a paper in the last year-book of the department, and two as papers in the fifteenth annual report of the Bureau. Correspondence on all subjects connected with dairying is sometimes so heavy as to greatly retard the other important work with which the office is charged. Some inquiries have recently been received concerning the dairy possibilities in the islands which have lately come under the control of this country.

During the year a detailed report was prepared upon the series of experimental shipments of dairy products to European markets, which were made under special authority given in the acts of Congress making annual appropriation for this department.

In the latter part of the year experimental shipments to Europe were again inaugurated, special efforts being made in connection with the department exhibit at the Paris Exposition to show the high quality of our dairy products.

A number of experimental shipments of butter, cheese, and cream have also been forwarded to trans-Pacific points, which had been visited and selected by a special agent of the department. On account of the great distance and the failure of some of the consignees to at first fully understand the purposes of the department's efforts, it is not yet possible to make a report upon these shipments.

The chief and assistant chief of the division have visited dairy centres in fifteen different States and attended the annual meetings of State dairy associations and similar bodies in ten of these States. It has thus been possible to meet and consult with many persons actively engaged in the dairy industry in different parts of the country and to learn their needs, and personal relations have been established which will be of material benefit in future work. No special agents for representing the department at important dairy meetings, which the officers of the division could not attend, were employed during the past year, as had been the practice during previous years.

Arrangements were made in the dairy division for the United States exhibit of animal industries at the Paris Exposition. The chief of the division took personal charge of the preparation of the various exhibits, which were planned to show, by photographs, models, mechanical devices, raw materials, and finished products, the development and present condition of the different branches of the live-stock industry.

The plan of the work of the dairy division for the fiscal year (1900–1901) includes a continuation of the different lines of work above reported.

Much valuable information concerning dairying in foreign countries has been received in the numerous reports from consuls, which were secured through the courtesy of the State department, and it is proposed to prepare these reports for publication as soon as the more pressing work of the division permits.

Attention to the many details in connection with the experimental exports requires a large share of the time of the working force of the office. Shipments of butter to Cuba and Porto Rico have been begun. In these experiments we are confronted with problems quite similar to those met in the shipments from San Francisco to the Orient. The dairy products are forwarded to warm countries, shipment has to be made without refrigeration, and cold storage is not available at the points of destination. It is necessary, therefore, to send butter, and perhaps cheese, as well as condensed milk and cream, in hermetically sealed packages, which afford the best means known of preserving such perishable products. It is hoped to obtain information useful to butter exporters in connection with the most important subjects of canning butter, and producing butter which has a hard body that will stand up better than even much of the high-grade butter marketed in this country. Experiments are now in progress at some of the State stations to determine the causes affecting the body of butter, and the results of these are awaited with interest by all who are engaged in foreign trade. Some countries, sending butter in cans to these new markets, supply a product with a very high melting point, showing in this, as in other ways, a disposition to adapt their products to the needs of these countries, an example our producers must follow if they are to successfully compete in these markets. The experimental shipments of the dairy division will be directed to showing our producers what needs to be done.

It is proposed to ascertain the prospects for trade in dairy products in the South American countries besides those already named.

Reports from the Paris Exposition show that the products of American dairies, creameries, and cheese factories have won a large number of high honours. A detailed report upon the dairy features of the exposition will be made later by the chief of the division.

The dairy division is arranging to make a suitable exhibit at the Pan-American Exposition in Buffalo. It will be in the nature of an object lesson, illustrating the wonderful development of this branch of agriculture.

It is considered extremely desirable that the existing system of Government inspection and certification of meats and meat products for export be extended, by additional legislation, so as to include butter, cheese, and condensed milk and cream for export from the United States. Reasons for such legislation have been stated in previous reports, and they apply now even more forceably than when first given. Briefly, a few of the arguments for such new legislation are as follows:—

Foreign buyers of dairy products have so often been deceived by misleading, and sometimes false statements, claiming that shipments of dairy products are high grade when really they are inferior, or in part inferior, that many of them suspect all products exported from this country, and avoid them whenever it is possible to supply their needs elsewhere. In this way we have recently lost a fine market in Great Britain for our cheese.

The department has expended much labour and money to establish a reputation abroad for American dairy products, and already the good results accomplished are being counteracted by the shipment of inferior goods, which are claimed to be of high quality. After the buyers on the other side have been defrauded a few times by such shipments, they will be unwilling to deal with us when it can be avoided.

Other countries have developed large foreign trade in their dairy products, and it is well known that one of the principal reasons for their rapid advance in the largest markets of the world, is the fact that their best products are marked with a Government stamp, showing conclusively that the article is as represented

The proposition of inspecting dairy products for export has been indorsed by nearly all of the large conventions of representative dairymen in this country, and it has the decided approval of commercial bodies and individual exporters. So far as this office is aware, no objection to it has been made.

Legislation by which the department shall be given supervision of oleomargarine and filled cheese, when offered for export, and perhaps also of the movement of these commodities in interstate commerce, after having been taxed and stamped under the regulations of the treasury department, seems advisable. These are food products, mainly of animal origin, and the duty of seeing that they maintain their true character when entering interstate and foreign commerce may properly be placed upon this department. It is easily understood that the spirit of the

oleomargarine and filled cheese laws require something more than their administration simply as revenue measures; and it is evident that the interests of consumers and producers of pure dairy products, and their imitations, and of honest dealers in all, would be greatly conserved by giving the department authority to prevent one from being substituted for the other, and to compel all to be sold under their true names and free from deception on the part of those who handle them.

Dairy Refrigeration.—see Refrigeration in the Dairy.

Dairy Thermometer.—see Thermometers.

Danish Bacon Curing.—see Bacon Curing in Denmark.

Danish Beef and Pork Sausage.—see Bacon Curing in Denmark.

Danish Production of Pork.—Article taken from *Ugeskrift for Landmænd.*—We are quite well aware of the fact that if we wish to make pig-breeding pay, as our butter and eggs pay, we must produce a first-class animal.

Our most dangerous competitors, the Irish, know this and don't intend to get left behind. A petition lately handed to the Minister for Ireland, Mr G. Balfour, by the Ulster bacon curers, clearly proves this. They demand pecuniary aid of the State to form breeding centres for pigs in Ireland. It is a curious thing to notice how our movements are watched. This can be seen from the petition published in *The Grocer*. It is competition from Denmark in bacon, on the English market, which has aroused the Irish to take these steps. Ireland sells 90 per cent. of its pigs to England, which proves that nowadays one can only make pig-breeding pay by producing a first-class animal. Qualities of a less high standard must compete with the *en masse* produce of Canada and the U.S.A. But Denmark is the worst competitor with good produce. From an insignificant import in 1886, it was reckoned in 1896 that the import of Danish bacon to England had risen to the value of £3,000,000 sterling.

Our product is described as though it, in the course of ten years, had approached perfection, and the process by which it has attained to this standard is also described, not only the treatment of it in the bacon factories, but by the importation of English pedigree animals for crossing with our own on scientific principles. This happy result is represented as being reached by the fact that the State has helped the theoretical direction of practical men, trained by science, by means of the Royal Agricultural Society; has given pecuniary aid to buy pedigree animals, to the advisers, railways and steamer transports, as well as paying consulents for the bacon factories.

In Ireland none of these things are asked for, but on the other hand State assistance for the breeding centres, from which boars should be distributed gratis to the farmers, in such a manner that they only become said farmers' property after having served a certain number of sows in a given time. Furthermore, pedigree keeping and feeding trials are recommended.

The description of affairs at home here are such as they ought to be, unfortunately not as they are in reality. We know from Statesconsulent Mórkeberg's description (founded on trials), that in three years the Jutland factories have had 36 to 53 per cent. in the first-class, Zealands and Lolland Falsters 20 to 28 per cent. same, and the rest in the second and third, and in the last three years the quality has been on the decline. One only needs to see the half pigs hanging on the bars at the factories to tell how far our produce is from the ideal, the long pig with plump hams and thick belly and even thickness of back fat. In Lollandish papers, where the director, O. C. Hansen, for "*Landmændenes Andels-Export Slagteri*," is exhorting farmers to improve their breeds according to Mr Mórkeberg's proposals, it is shewn how easily bad quality meat is almost unsaleable on the English market when affairs are dull. For example, in the spring of this year (1896), bacon was sold for 28/- which after agent's commission, freight, etc., were deducted, brought only 23 öre net, per Danish lb., a loss felt very much by Danish co-operative shareholders. At dull times, such as this year's minimum prices, the farmers could be directed to seek the gain entirely in the difference between third and first class prices.

It is certainly a problem of the greatest economical importance for our agriculture, that we cease to feed with stuff which cannot produce first class goods, even if we feed ever so carefully and rationally.

It is in that direction that the Irish are now turning their attention, and for that object they require help from the State so that we may not run past them. It must, therefore, be our aim to make their description of our high quality a reality, get ahead of them or at any rate try to prevent their getting ahead of us, make up our minds to absolutely "go for" an improvement in pig-breeding.

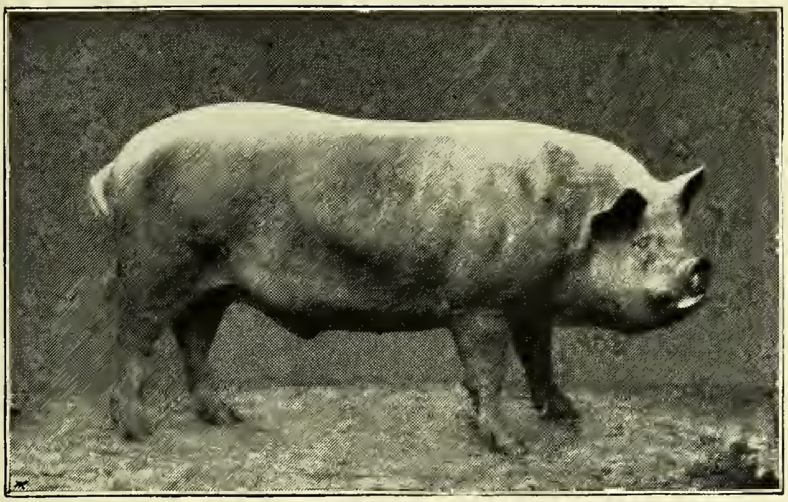
Mr Mórkeberg points out, as is well known, that according to the results of his pig-breeding experiments, the crossing of the breed with large English boars, in order to create a breed absolutely like the improved animal from which we make our bacon, is not at all suited to our ordinary agricultural purposes. The result is a much too pampered breed for our circumstances, the young animals turn out far too small and with too little powers of resistance; the sow often has not the necessary milk, and the care which should necessarily be taken when changing the porkers from the sow's milk to other food, can not always be given them. Many, too many of the youngsters find their way to the dung heap or become stunted in growth and the breeding is therefore too dear. According to Mr Mórkeberg no more strange blood must be crossed with our sows.

Mr Mórkeberg's project is, therefore, to create a land race for the breeding of sows which may turn out healthy, strong, hardy, have plenty of milk, and be able to give birth to litters capable of living and having at the same time a fair size, growing propensities, and as good a shape as possible.

Breeding centres for land-hogs should be based on the material present in each district and be established by the local farmers' associations. There is therefore no time to be lost in finding out throughout the country any material suitable for this object, and to place it in the hands of such men who are most to be depended on to look after the breeding as regards the district's supply of sows.

The boars to be employed should be of the pure Yorkshire breed, unmixed blood. It is also proposed to start breeding centres for large Yorkshires of pure breed, which should be undertaken by the associations in different provinces.

Mr Mórkeberg thinks that the necessary co-operation and distribution of breeding animals amongst the various breeding stations in the country is better worked in this way, than that the bacon factories should manage these; but naturally



Typical Danish Bacon Curer's Pig.

there must be co-operation between the farmers' associations and the bacon factories, the latter of which are best able to criticise the results of the undertaking, and also able to give pecuniary aid to the same.

In Zealand, Fünen, and Bornholm, the farmers' associations have taken up the subject, and it is expected that in a short time other associations in the other districts of the country will follow suit. There are already a number of breeding centres for Yorkshire pigs in this country. Four in Zealand at Kjóng, Flakkebjérg, Toastrup, and Fredericksund; Dortheasminde in Uldum, near Horsens, and Christianslund, near Bogense. It is to be hoped that other districts will be able to draw, at present, the necessary supply of boars for service from these places, and afterwards both sows and boars to form new provincial centres. If these do not suffice, one must naturally fetch them direct from the well-known breeding centres of this race in England, in spite of the difficulties of the quarantine and the great expense.

It is a much more difficult problem now-a-days to find material for breeding sows, which will satisfy the necessary requirements in our much crossed pig race. A great deal of energy and practical knowledge must be exercised by the farmers' associations in order to attain good results as regards breeding centres.

So long as a district cannot get a supply of sows from these places, the producers are compelled to get hold of them as best they can and from where they can. Mr Mórkeberg's results of trials will have done much to sharpen the wits of producers as regards this, and to support the fact that sows of the type he describes are the correct ones, which most pig breeders will have found to work out all right in practice.

Danish Hard Smoked Sausage.—see Bacon Curing in Denmark.

Danish Sausage Making.—see Bacon Curing in Denmark.

Danish Smoked Sausage.—see Bacon Curing in Denmark.

Deer Ham.—see Ham.

Desks.—see Cash Desks.

Devonshire Hogs' Puddings. — see Cornish Hogs' Puddings.

Devon Meat Puddings.—

10 lbs. pork, fairly lean.
$1\frac{1}{2}$,, dry bread and crusts.
4 ozs. salt.
2 ,, white pepper.
$2\frac{1}{2}$,, food preservative.
Add a dash of mace and nutmegs.

Method of Preparation.—Chop altogether into a fine paste, adding water as may be necessary so as to soften the mixture. Fill into bullock's casings of the narrow sort and drop into a cullender or perforated cooking vessel, and place this in a bath of water at 200° F. for twenty minutes. Lift out the cullender containing the puddings, and either plunge into cold water till cold, or allow to cool gradually.

Digestors.—see Bones and the best means to utilise them.

Dipper.—see Lard Renderers' Tools, also Ladle.

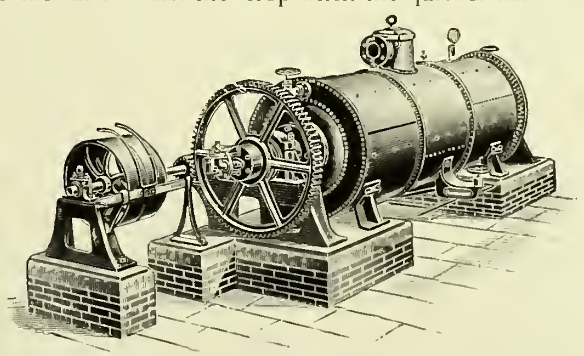
Disintegrator.—see Bones and the best means to utilise them.

Dressing for Hams.—see Ham Dressing.

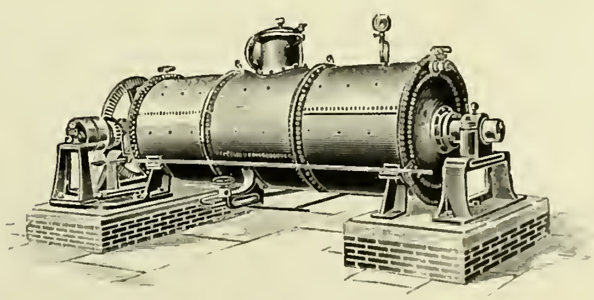
Dressing Tripe.—see Tripe Cleaning and Dressing.

Dried Beef.—see Beef (dried).

Dried Blood.—Dried blood as a manure is a standard article of commerce. It is rather slow of action and is therefore commonly blended with more active manures, and it comes in to assist the crop when the quicker manures are

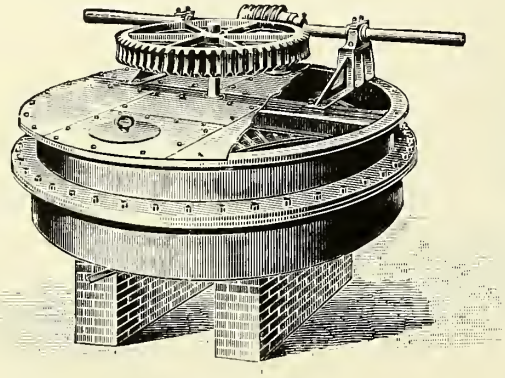


Anderson's Blood Drier



Anderson's Blood Drier.

exhausted. The fresh blood is allowed to become clotted and is then cut into slices, and placed in suitable vessels to allow the clear serum or blood albumen to drain away. The residue is then sometimes dried on open store kilns, but this leads to nuisance and loss, and the better method of treatment is to conduct the drying in revolving steam jacketed



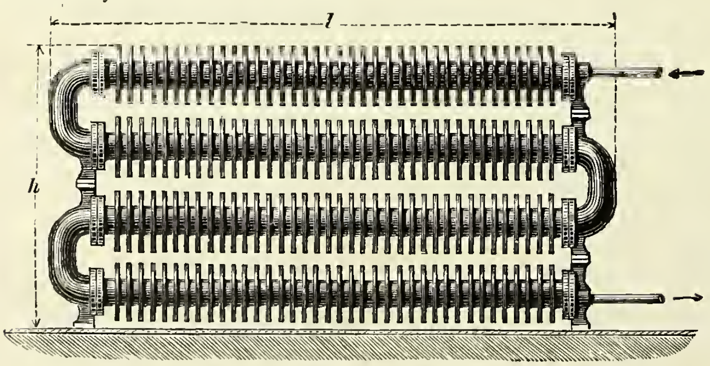
Johnstone's Blood Drier.

driers with scrapers to keep the blood from sticking to the drying surfaces. The illustration shews Johnstone's patent drier constructed on the above principle. Those in use in America are mostly cylindrical in shape.

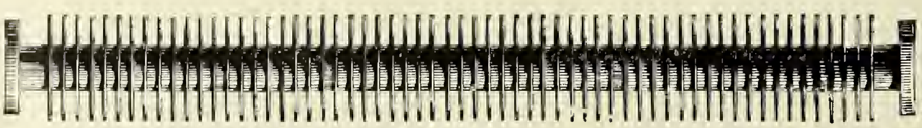
Drying.—(To cure hams and beef for drying).—American Recipé.—To 100 lbs. of meat use :—

7 lbs. coarse salt.
5 „ brown sugar.
4 ozs. saltpetre.
1 oz. saleratus.

dissolved in water—say about 4 gallons, or sufficient to cover the meat. Pack the meat in the cask without any additional salt and pour the pickle over it. Let it stand about six weeks, then take the meat out and smoke it. Hang the hams in the smoke house, the legs downwards. After smoking, slip each ham into a loose muslin sack to keep off the flies, and hang them up in a cool dry place. Be careful that the hams are not frozen when the pickle is put on or they will not take the salt.



Built up Radiator of Gilled Pipes.



Gilled Pipe

Drying Room.—Wherever bacon or hams are dealt in, there is generally occasion to use a drying room. Pale dried hams, pale dried bacon, and imported bacon of all kinds are very often required in the dry condition. In order to provide means for this operation, it is necessary to have a separate room with a line of pipes on which are cast gills for radiating the heat.

These pipes are laid round the room and are connected with a supply of steam ; they radiate four times more heat than can be derived from plain steam pipes, hence in use, they are very economical. The heat required in a drying room is from 85° to 90° Fahr., at which temperature most goods will be dried economically.

Dunmow Flitch of Bacon Festival.—This festival or custom was instituted by Juga, a noble lady, at Dunmow, in Essex, in A.D. 1111, and was restored by Robert de Fitzwalter in 1244, on the following conditions :—"That whatever married couple will go to the priory, and kneeling on two sharp-pointed stones, will answer that they have not quarrelled nor repented of their marriage within a year and a day after its celebration, shall receive a flitch of bacon." The prize was first claimed in 1445. Endeavours have been made to perpetuate the custom, so that each year sees the festival in full swing with a larger or lesser number of applicants.

The flitch or gammon of bacon is the side with the leg cut off and the bones taken out. The loin of beef has had Royal honours bestowed upon it, and it is considered the staple dish of English hospitality ; but the flitch of bacon has been still more honoured in having been appropriated as the honourable reward of matrimonial fidelity, forbearance, and love. At the priory of Little Dunmow, in Essex, any couple from any part of the Kingdom who have been married a year and a day and will take the oath, are entitled to a flitch of bacon.

"You shall swear by the custom of our confession,
That you never made any nuptial transgression,
Since you were married man and wife,
By household brawls of contentious strife,
Or otherwise in bed or at board,
Offended each other in deed or in word,
Or since the parish clerk said Amen,
Wished yourselves unmarried again.
Or in a twelve-month and a day,
Repented not in thought any way,
But continued true and in desire,
As when you joined hands in holy quire.
If to these conditions without all fear,
Of your own accord you will freely swear ;
A gammon of bacon you shall receive,
And bear it hence with love and good leave ;
For this is our custom at Dunmow well-known,
Though the sport be ours, the bacon's your own."

The same is offered at Whichenovre Hall, in Staffordshire, where the oath is less strict :—"Hear ye, Sir Philip de Somerville, Lord of Whichenovre, maintainer and giver of this bacon, that I (A. B.) since I wedded (C. D.) my wife, and since I had her in my keeping and at my will by a year and a day after our marriage, I would not have changed for none other, fairer nor fouler, richer nor poorer, nor for none other descended of greater lineage, sleeping nor waking at no time, and if the said C. D. were sole and I sole, I would take her to be my wife beforeall the women of the world of what condition soever they be, good or evil, so help me God."

It has often been said that the reward at Dunmow was instituted really by the monks of the priory, as a satire on the too general fate of marriage, and the last line of the above poetry seems to countenance the idea. The claimants have been comparatively few since the festivai was first instituted, but other reasons may be assigned for the want of candidates, than those which are unfavourable to the married state. Without meaning any reflection on those who have successfully claimed it, it may, perhaps, be said that in general, those who really deserve it are the least likely to come forward publicly, paying respect to their own ease and modesty. There are, no doubt, too many exemplary and happy couples who nevertheless cannot exactly take the oath.

The frailties of our nature, as examplified in the manners of the world, and especially in courtship, are in too many instances unfavourable to produce the happiest effects in the early days of marriage. Women who have been idolized, and who have been given to understand that they were all perfection, and were to receive no contradiction and to have the conduct of everything, when they came to be wives, and the husband exercises that judgment, decision, and authority, which are his duty, must have tempers and judgments far, very far, above the generality, if they do not feel and express some dissatisfaction; and the husband must be of a very forbearing temper indeed, who can conduct himself on such an occasion without offence. Even congenial tempers, like the fellow-shells of the scallop fish, have their irregularities, their roughnesses, their prominences, and their recesses, and they cannot be brought together to suit exactly, without care and accomodation. The strongest and the sweetest wine has undergone its fermentation before it delights the taste, and "maketh glad the heart of man." A reward offered to those who could make a reasonable deposition at the end of any year and a day after marriage would, no doubt, be much more frequently claimed.

For fuller particulars of the Flitch Festival, see Fuller's "Worthies"; Herne's "Antiquities"; "The British Traveller"; the "European Magazine"; and the "Spectator," Nos. 607 and 608.

Dusting Bellows.—see Bellows for Distributing Powders.

EGG and Poultry Imports.—Eggs continue to increase in quantity so far as the imports are concerned, 1899 showing an advance on 1898 of about 12 per cent.; Russia is the largest shipper. The aggregate value of the year's imports in 1899, amounted to £5,044,392, the number of eggs being entered at 1,940,971,000. The value of poultry and game imported for the same period was £785,294.

Eggs, Cold Storage of.—see Cold Storage of Eggs.

Eggs in Victoria.—see Victoria (Australia).

Egyptian Sugar.—see Cane Sugar.

Elevators.—see Hoists.

Electricity.—In the following article we propose to leave out the older applications of electricity such as bells, telegraphs, and telephones, and to confine ourselves to some of the newer uses to which it has been put, viz., lighting and power transmission. Generally it may be said concerning both these adaptations of electricity, that they are of great importance owing to the absence of the heating effects which are inseparable from gas lighting and the use of steam, gas or oil engines for power purposes. First as regards lighting—for small or low pitched interiors there is no doubt that incandescent or glow lamps are undoubtedly the best system to adopt; but it must not be forgotten that the consumption of electric energy in incandescent lamps is from three to four times that necessary with arc lamps, and therefore, wherever it is possible, arc lamps should be chosen. There is a small lamp on the market known as the "Lilliputian" arc, the length of which is only 13½ inches over all, and which is shown in Fig. I. (next page), which gives, with three amperes of current, a light equal to six incandescent electric lamps of 16 candle power each, and which burning, as it does, on the enclosed arc principle will last for 24 hours with one trimming of carbon. This lamp is certainly the most simple in construction of any, being without clutches, racks, or any other complications. A sectional view of the mechanism given in

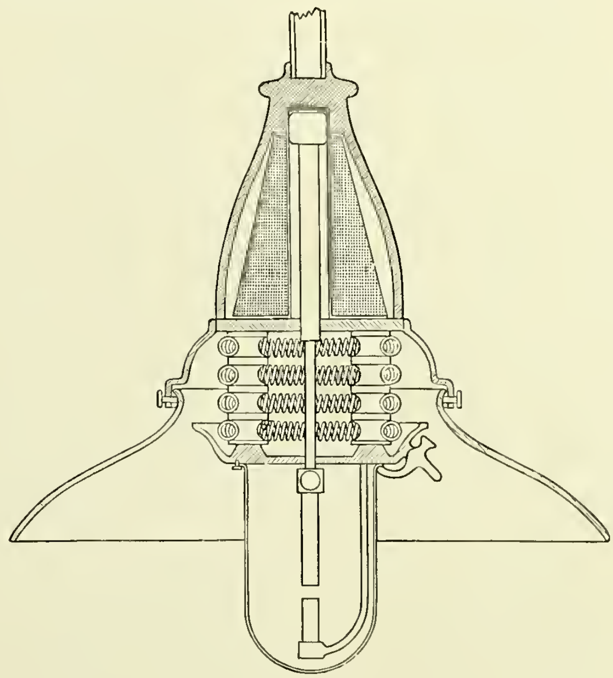


Fig. II.

Fig. II. will show that it consists simply of an electro-magnet, or rather solenoid, the interior of which contains an easily fitting plunger which forms the dash-pot, or regulator, which controls the striking of the arc, and to which is directly connected an iron rod which is sucked up into the solenoid. To this rod is attached the upper carbon and as this burns away the rod descends and maintains the arc constant. A regulating resistance adjustable to the correct voltage, or pressure of the circuit, is shown surrounding the lower part of the carbon-supporting rod, and at the bottom is the bulb enclosing the arc, which is secured in position by two screw head clips and a spring clip, so that it can be removed instantaneously for retrimming. This lamp is made for direct currents only, and for pressures varying from 100 to 150 volts, but, with the addition of an external resistance, can be used on pressures up to 220 volts. As 6-16 candle power incandescent lamps would consume nearly 4 amperes of current, and as owing to its shortness the "Lilliputian" can be used in rooms as low as eight feet from floor to ceiling, it is an economical light producer wherever the

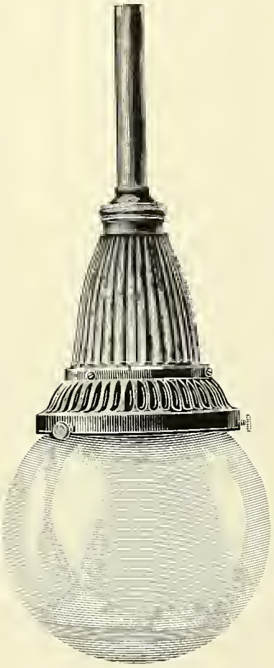


Fig. I.

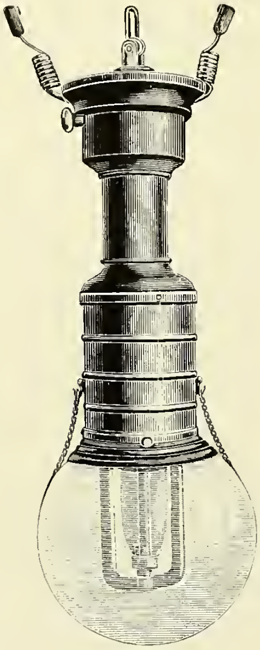


Fig. III.

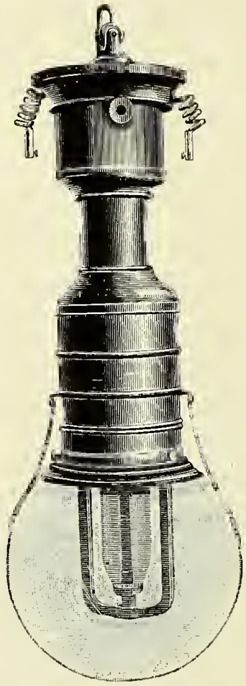


Fig. IV.

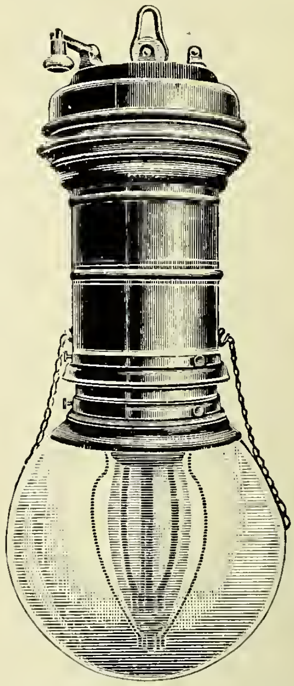


Fig. V.

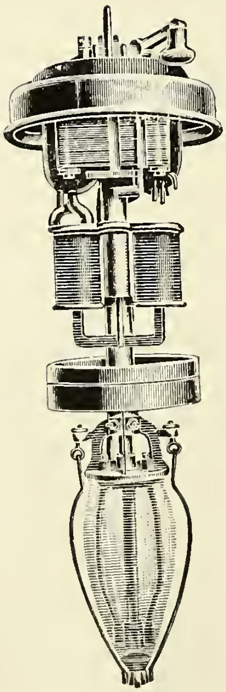


Fig. VII

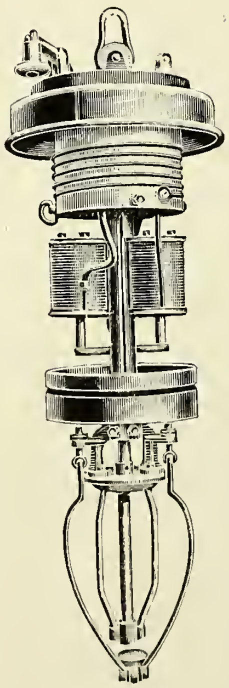


Fig VIII

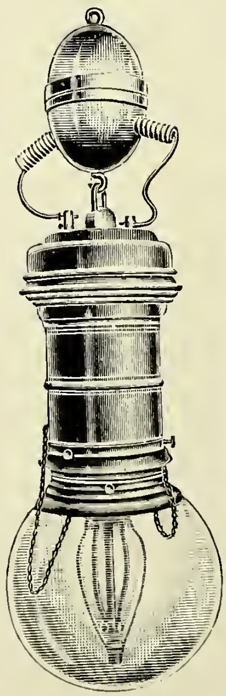


Fig. IXA.

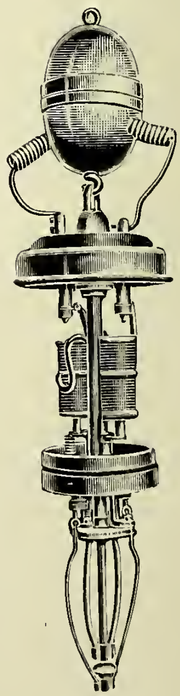


Fig. IXB.

chamber is large enough to require more than 6-16 candle power lamps. A rather more complicated, but still very simple, pattern of "Lilliputian" lamp is also made, to burn for 50 hours with one trimming of carbon, without any increase in the size of the lamp, and the smaller amount of labour required for trimming the longer burning form, is well worth consideration where the premises are large enough to require a number of lamps.

In the case of large and lofty interiors, arc lamps are undoubtedly the most economical method of lighting.

These are of two kinds, viz., *open*, in which the carbons are burned in free contact with the atmosphere, and *enclosed*, in which the carbons are surrounded by a nearly air-tight containing vessel, which, by prolonging the life of the carbons to an enormous extent, decreases the cost of trimming labour and carbon consumption to a minimum. So greatly is this so, that it may be mentioned that the same length of carbon which, in an *open* type arc lamp, would last only 8 to 10 hours, will, in an *enclosed* lamp, burn for from 150 to 175 hours without attention. This means that if an *open* arc lamp requires trimming every day, an *enclosed* one would only require attention every fortnight or three weeks, and if an *open* lamp cost £3 per annum for carbons, an *enclosed* one would cost 4s. These are great and considerable advantages in favour of the latter, and it is singular that they have been so little appreciated as yet within the United Kingdom, whilst in the United States of America they have so completely superseded the *open* type of lamp, that it is doubtful if there is a single open lamp manufactured there at the present moment. A further advantage of the enclosed lamp is that it can be placed *singly* on circuits, having a pressure of 100 volts, whereas the open lamp must be placed *two in series*, and it is therefore impossible to burn one singly without having to pay the cost of two. Where the bluish colour of the light is not a drawback, enclosed lamps can be obtained which will burn singly on pressures as high as 250 volts.

All the above remarks are made with reference to direct current circuits, but they apply with equal force to alternating current supplies, and although by the use of choking

Fig. VA. Economy Coil.

coils, the loss due to turning out one of a pair of lamps burning in series on 100 volts is minimised to a certain extent the superior light given by an enclosed lamp burning on alternating currents, owing to the greater length of its arc, with the same expenditure of energy, and the cheapness with which it can be maintained, owing to the small consumption of carbon and infrequent trimming required, give it an undoubted advantage over its older and better known rival. In Fig. III. we show a single parallel lamp for use on 100 to 120 volts pressure, in Fig. IV. a lamp for burning two in series or in single parallel on 200 to 250 volts, and in Fig. V. a lamp to burn singly on alternating currents of 100 to 120 volts, or, with an economy coil, one form of which is illustrated in Fig. VA., singly on 200 to 220 volts. All these lamps are of the largely used "Stewart" type. Concerning the last (the Alternator) a great advantage at this time, when it appears as if the Supply Companies., now using alternating currents, intend to abandon them in favour of the direct system of supply, is found in the fact that it can be converted, at slight cost, so as to work equally well on direct currents. In Fig. VI. we give a view of the mechanism of the direct current "Stewart" lamp. It consists of two rods or tubes R.r., held nearly parallel by two sets of links L.l. The upper end of R. moves in a bushing (not shown)

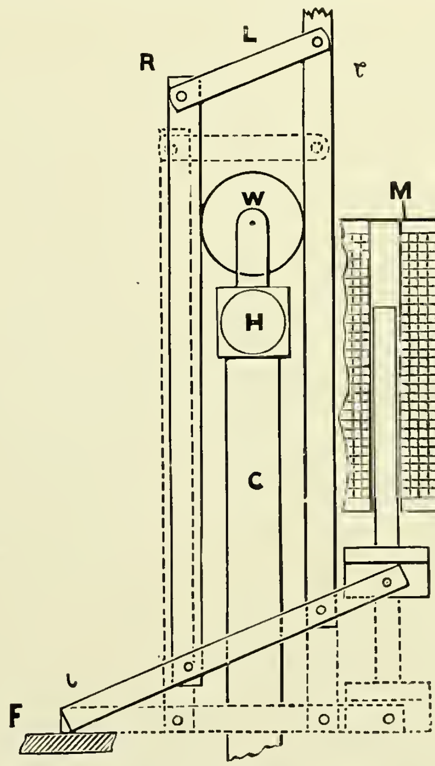


Fig. VI. Diagram of Mechanism of Stewart Lamp.

so as to keep the rods in a vertical alignment at all times. One of the links, l. is connected to the core of the regulating magnet (or solenoid) M., whilst the other rests, when feeding, on the frame indicated at F. The core in its upward movement tends to bring the two rods closer to one another, and in this way clamps the wheel, W., to which is attached the carbon holder, H. The full lines show the position of the rods when the lamp is in operation and the carbons separated. The dotted lines show the relative position of the parts when no current is passing through the lamp. It will be noticed that in this position the wheel, W., is perfectly free to fall, there being about $\frac{1}{16}$ of an inch between rod and wheel. The action of the rods is similar to that of a parallel ruler. When the length of the arc becomes such as to increase the resistance of the arc above the normal, the current passing through the solenoids, M., is decreased and their cores drop. The link l. resting on the frame, F., will tend to spread

the rods as the cores drop, and the rods will finally come to a position where they no longer grip the wheel, which then falls and feeds the carbon, C. An overfeed, and consequent increase of current, is impossible, owing to the fact that the possible travel of the cores is greater than the length of the arc.

In Fig. VII. we show the construction of the "Stewart" interchangeable alternating lamp, and in Fig. VIII. the same lamp as arranged for direct current. (See page 160).

For a long time, in fact up to the last few months, it was thought that it was impossible to utilise more than from 70 per cent. to 75 per cent. of the total energy given to an arc lamp *in its arc* as it was necessary to use a steadying resistance in series with the carbons and regulating mechanism; but before leaving this part of our subject we think it only right to draw attention to the "Continental" lamp in which, for the first time, an arc efficiency of 88 per cent. is obtained. Here all resistances in series with the mechanism are done away with, and a choking coil takes their place. Under ordinary circumstances, a choking coil has no effect at all in a direct current circuit, that is to say, as long as the current remains steady, but should this tend to alter, an induction current is set up in the coils of the lamp which, reacting on the carbon feeding mechanism, causes them to approach or recede from one another according as the current tends to increase or diminish. Fig. IX. shows a

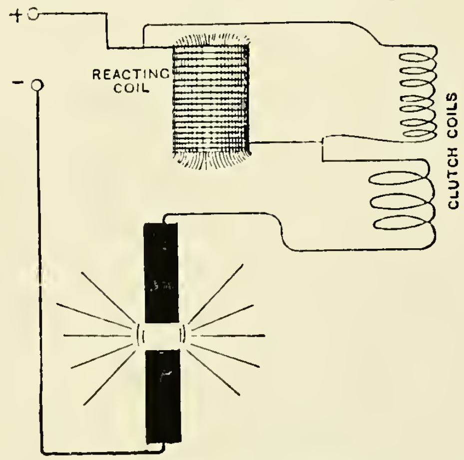


Fig. IX. Diagram of Continental.

diagram of this important principle of regulation, which although well known to electrical engineers, appears never to have been previously utilised. Here the current entering at the point x, passes through the choking (or reacting) coil, through the bottom thick *clutch coil*, thence through the carbons and out at the point −, but it will be noticed that there is another thin clutch coil connected across from one end to the other of the reacting coil. As long as the current through the lamp is steady, little or no current passes through this fine coil. If, however, a sudden variation of current takes place, either from change of pressure of the supply, or through change of length in the arc, there is an immediate alteration in the state of affairs; a strong current is sent through the fine coil which tends to separate or cause the approach of one carbon to the other, and so maintain the current and light constant. A gain of light of 35 per cent. is claimed for this lamp with the same expenditure for electric current. Fig. IXA. shows the outside appearance of the "Continental" arc lamp, and Fig. IXB. its internal mechanism.

Special notice should be taken of the method of securing the inner bulb of this and the "Interchangeable" lamps Figs. VII. and VIII., whereby the inner bulb is made quite independent of the carbons, so that any waste of parallelism in the grinding of the upper edge, or bearing surface of the bulb does not affect the trimming of the lamp, which can be re-carboned whilst hot and as quickly and accurately as the simplest open type arc, whilst a better vacuum can be obtained than by the use of a loose bulb-cap. We understand that this improved trimming device can be obtained with all types of "Stewart" lamps.

We have treated thus fully of the enclosed arc lamp, because we believe that it is destined to supersede the open type as completely here as it has done in the United States, where the people, not being as conservative as Britishers, are quicker to take advantage of such improvements, and thus lead the way, whilst we are content to follow.

Returning for a moment to incandescent lamps, a considerable difference in the quality both for life and light-giving will be found. As a general rule a lamp taking from 3 to 3½ watts per candle power should have a useful life of from 600 to 800 hours. There are some lamps on the market which are supposed to consume a great deal less, but under ordinary circumstances it is doubtful, first, if they can be relied on to do so, and second that, even if they do, their life is long enough to warrant their use. So as to render our remarks as non-technical as possible, we will explain that Watts are found by multiplying Volts of pressure by Amperes of current, and, to obtain Watts per candle power, dividing by the candle power of the lamp; thus a 16 candle 100 volt lamp taking ½ an ampere would consume 50 watts or 3·2 watts per candle power; too little care is taken by the consumers to test and check the consumption and life of the lamps they purchase. One thousand watts equal a Board of Trade unit, which is the basis of charge by meter. To most people a lamp is a lamp, and they are more influenced by the name it bears than by its actual electrical and mechanical qualities.

If only consideration were given to the fact that, given an equal useful life, a 50 watt 16 candle lamp will be nearly 20 per cent. cheaper to use than one taking 60 watts for the same power, or, to put the matter plainly, if the first costs, on a certain installation, £100 per annum for current, the second will cost £120 per annum, more care would be given to this point.

Similarly with regard to price: Lamps can be purchased all the way from 6d. to 1/9 each for 16 candle power. Now if the first will run for anything over 230 hours to the second's 800 hours, it is easy to see that it will be the cheaper to buy. A further point is the maintainance of the initial candle power. An old and blackened lamp which originally gave 16 candle power may, and sometimes does, fall to less than 10 before it will finally die of old age; but it will cost as much to run it at 10 candle power as it did at the start when it gave 16 candle power; frequent comparison should therefore be made between new lamps and those which have been running for some time, and those which have outlived their effective or useful life at once taken out and replaced by new ones. This is what we refer to as the useful life of a lamp and it is by no means the longest lifed lamp which is the most economical to use. In this direction, as in every other, the best is undoubtedly the cheapest in the long run; the test of cheapness is quality, not low price. When properly installed, with the use of the highest class materials

and labour, nothing can equal the safety of electricity as an illuminating agent, but if the price is cut so finely that first class materials and workmanship are impossible, it may become as dangerous as gas or mineral oil lamps. Care should therefore be taken to see that all wiring is done with conductors large enough to ensure that a drop of pressure not greater than 2 per cent. takes place at the most distant lamp, not when the usual number, but when every lamp is in use; by this means advantage is taken of the greatest possible percentage of the electricity supplied from the public mains or generated by the dynamo, for the production of light, instead of its being wasted in heating the conductors. Also that all cables and wires, if enclosed in wood casings, are well insulated by being covered with a good non-conducting coating of pure and vulcanised india rubber, protected over all by plaited hemp or jute served with waterproof compound, and that the wood casing is painted both inside and out, with at least two coats of paint. Regarding this wood casing it should be noted that, although large quantities of work are still executed here in this manner, it is not permitted at all on the best work in the United States of America, where it is necessary to run all wires on porcelain insulators, or enclose them in welded iron tubing properly jointed and thoroughly waterproof. This latter method is slowly coming into use in this country, and should always be adopted in the interior of refrigerating chambers or other places where excessive dampness is expected to be present. Another method, which can be highly recommended, consists in the use of wire covered with cotton or paper impregnated with an insulating material of a plastic pitchy nature and covered externally with lead, which is forced on in close contact with the insulation. The drawback to this method is that the lead is soft enough to be penetrated by nails, and if the wiring is concealed in the plaster of a wall nothing but iron tubing should be used. If good insulation is necessary in the case of the wiring, the whole of which is covered from end to end with some insulating material, much more is it necessary to see that cut-outs, switches, fittings, etc., are made in such a manner, and so connected, that leakage of current is impossible, for it is at these points that, of necessity, the covering of the wires must be stripped off and the bare copper conductors connected. Porcelain is undoubtedly the best material for the bases of cut-outs and switches, and the interiors of incandescent lamp holders, although carefully selected slate runs it closely, particularly if enamelled, and its use is almost a necessity on large switches, as porcelain cannot be produced in large pieces, with a sufficiently level surface, and either enamelled slate or marble must be used for main switchboards.

Where there is no public supply, it is needless to say that a generating plant for the production of electricity becomes a necessity; but even where the Town Authorities or a Supply Co. have mains, it is often a question whether it will not be cheaper and more satisfactory to produce the electricity on the premises. The number of lights, and more particularly the length of time they will be kept burning, will govern the decision for or against this, as also will the question of whether space can be found, or, being found, can be economically given up for it. It is false economy to too much cramp the space in which the machinery is to be placed, although careful selection of the driving power will often allow of its being greatly minimised. Where steam power is available, direct connected generating plants where the armature of the dynamo practically forms the fly-wheel of the engine as in Fig. X., are to be recommended. Here the space occupied is as small as possible, but where first cost has to be considered, or the installation is a small one, or steam power is not possible—then belt driving must be resorted to. When this is done the belt should be as long, within reason, as possible, as by this means the necessity of using a tight belt and much friction of bearings, both on engine and dynamo, is avoided. No matter what description of engine, steam, gas, or oil, is adopted, good speed governing is essential, for it must be remembered that the volts, or pressure, of the supply will vary almost directly as the speed, and that anything over about 1 per cent. is easily noticeable on incandescent lamps, particularly if the variation of speed is sudden or constantly recurring as in the case of an ill governed engine. The governor should therefore be a high speed one, and on small installations the engine itself should be of fairly great number of revolutions per minute. High speed both on engine and dynamo is by no means a drawback if good and efficient means of lubrication are provided. Our remarks about good governing are doubly needful if gas or oil is the motive power, because whilst steam may be

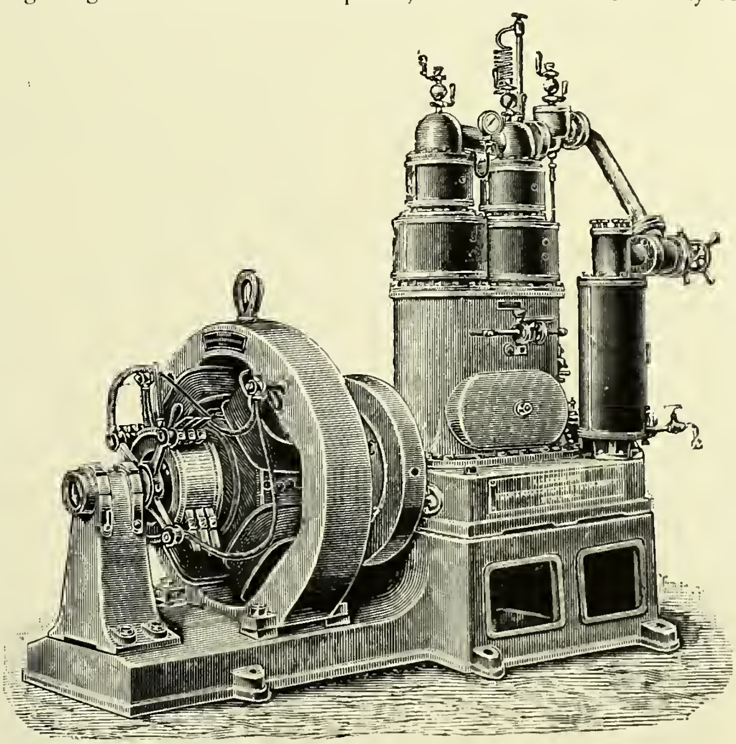


Fig. X.

regarded as pressure engines, gas and oil engines receive their energy from the explosion of their fuel, and not only that, but whilst steam engines receive renewed impulse at least once, and generally twice, in each revolution, the best gas and oil engines work on the "Otto" cycle, and only have one explosion to every *two*, and when not working up to full power, it may be four and even six revolutions. Their fly-wheels therefore require to be exclusively heavy so that they may store up sufficient energy or momentum to keep the speed constant between the explosions. A high speed electric lighting engine should work at 250 revolutions per minute, and be fitted with special high

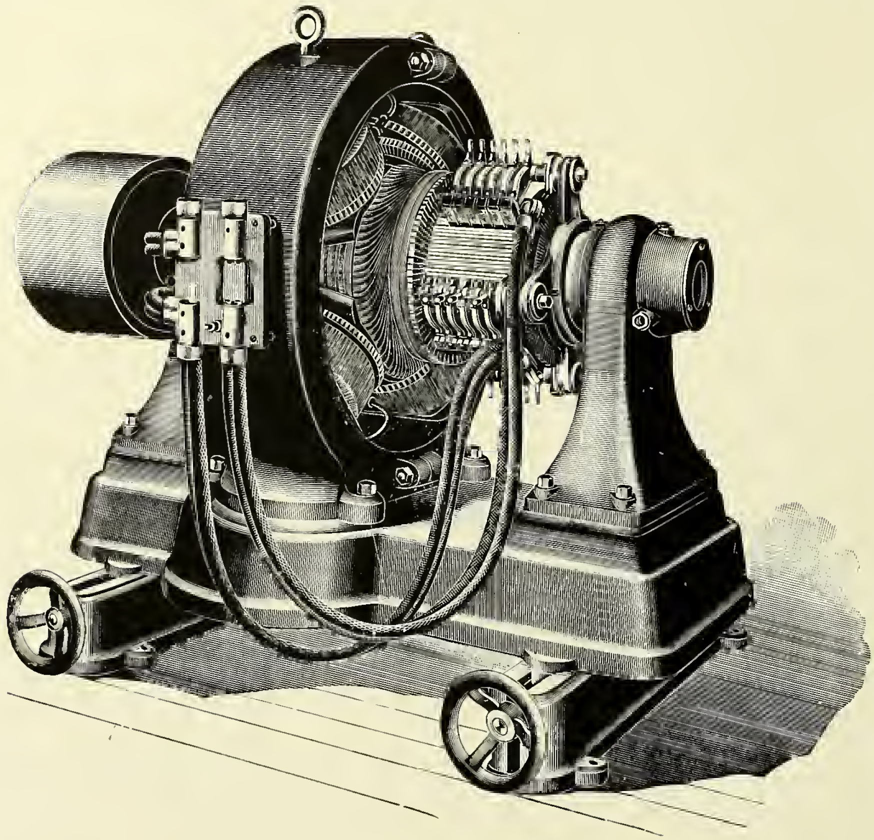


Fig. XI.

Fig XII. represents the frame of a 15 horse-power motor or 225-(16 candle power) light dynamo, with pedestal set alongside, so as to show the construction and the proportion of parts.

The Base is symmetrical and well finished. The edges are flanged deeply to give it a solid appearance; yet at the same time it is light and strong, the under side being heavily ribbed throughout.

The Field Ring is a continuous one without joint and it is bolted to the frame. It has ample cross section for the magnetic circuit and is symmetrical with the other parts of the machine.

The Pedestal is of one piece bolted directly to the base, giving free access to the armature, and permitting the easy removal of the same. This construction, which may be seen by referring to the illustration, is a decided advantage over that of machines which have the pedestal and base cast in one piece.

The Field Cores in the larger sizes, from 5 horse-power up, as motors, or 75-(16 candle) lamps, as dynamos, are round and made from soft wrought iron, cast-welded into the field ring by a special process which makes a perfect magnetic joint. By referring to the illustration showing the dissembled machine, there will be seen lying upon the base, a cast iron detached pole shoe. These detachable shoes serve two purposes, one mechanical and the other electrical; first, they enable the field coils to be assembled quickly and with ease; secondly, by their special form, they reduce the density of

speed governor, two heavy fly-wheels, and altogether well thought out and adapted for the work it is intended to do. Not less important to a good engine, is the selection of a suitable dynamo. Fig XI. shows a typical four pole open type dynamo suitable for working, according to its size, from 14 to 900 incandescent lamps of 16 candle power, a pro rata number of larger or smaller candle power, or 1 to about 30 enclosed arc lamps taking 5 amperes each, or as a motor (for the same machine which produces electricity if mechanically forced to revolve, becomes a motor if supplied with electricity from an outside source), to produce from 1 to 60 horse-power.

The increasing demand for motors and dynamos to supply a large variety of uses has called forth some very radical changes in design—changes that necessitated machines embodying slow speed, compactness, and efficiency; therefore to meet these requirements, the majority of manufacturers have adopted the multipolar type as a basis upon which to build.

In getting out this particular line of multipolar machines, no expense has been spared in the designing and manufacture to make them electrically and mechanically perfect. The latest and best ideas, that experience has shown to be correct, have been followed, and many new and valuable features have been embodied which are not found in other makes. These improvements, combined as they are with the best workmanship and material, have produced a machine that has no superior.

Fig. XII.

the magnetic flux as it enters the teeth of the armature, thereby aiding in perfect commutation. These detachable shoes are securely and perfectly fitted to the pole pieces, being held in position by four dowel pins. In the smaller sizes, however, the cores and shoes are cast in one piece and tightly fitted into bored holes in the field ring.

The Magnetic Field has been designed with the special object in view of obtaining a stable field at all loads, and a high efficiency at light loads. The makers have been most successful in accomplishing this and have produced a line of machines perfect in this respect. We especially desire to call attention to the above feature, in contrast to that of other machines having an excessively strong field and being consequently inefficient. Such abnormal strength of field is often resorted to in order to cover up faulty armature design.

The Journals are of hard phosphor bronze provided with double oil rings, and are mounted in the oil chambers of the pedestals. This construction has three valuable features. First, the sleeve is perfectly free to move within certain limits, and cannot be clamped or forced out of its position from true alignment. Second, the pedestal is so arranged that the motor may be run in an inverted position overhead, or bolted to a wall, without any change being necessary beyond giving the sleeve a quarter or half turn. Third, the bearing sleeves can be removed for examination or cleaning without disturbing the armature or pedestal.

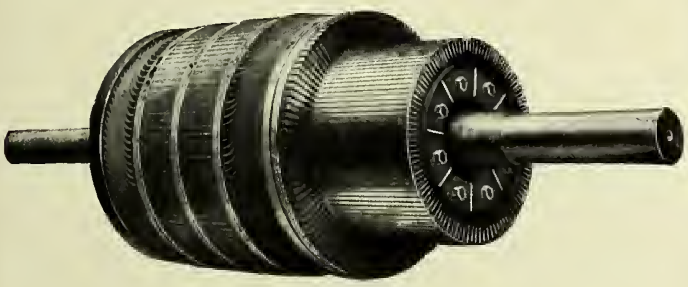


Fig. XIII.

The Armature is the vital part of the machine. Probably more money, embodying more thought, time and study, has been spent in perfecting the armature of to-day, than has been expended in a component part of any other machine on the market, in the world. From the conception of the dynamo and motor for commercial uses, the armature has been the king pin around which the designer has swung. Its improvement has been far more mechanical than electrical, yet necessarily so, as durability has been the chief requirement. Suffice it to say that the larger sized modern armatures of to-day made by the best builders are practically indestructible, and with equal force we can say that the armatures made by cheap builders are worthless and a source of constant annoyance and expense.

A few words might not be amiss in a description of this armature. Fig. XIV. shows the core and commutator mounted on shaft, while Fig. XIII. shows a finished armature, ready to be placed into a machine.

It will be noticed that it is well proportioned, having a large diameter, ample commutator, and stout shaft. In all sizes of machines the armatures are relatively large, the number and form of teeth and the arrangement of winding are in accordance with the best practice in modern designing. A brief description of the construction will show that every detail has received careful consideration. There are so many details of real importance that a description of each would be impossible.

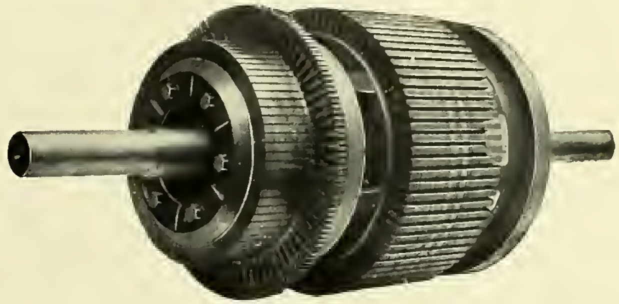


Fig. XIV.

The Shaft in all sizes of machines is especially large and made of the best crucible steel, and is ground and polished exactly to gauge at bearings.

A Spider is mounted upon the shaft in all sizes above 5 horse-power, keyed and set-screwed thereto. The stampings that make up the armature core are mounted upon this spider, and separated therefrom magnetically by four brass keys running the entire length. This construction absolutely prevents any magnetic unbalancing of the core. The stampings being thus held in position by keys and by end plates locked to the spider, obviate the use of bolts through the core.

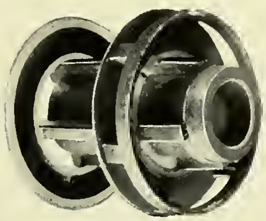


Fig. XV.

The armature spider with end supports locked thereto, and also the armature core mounted upon the spider ready to receive the coils, are shown in Figs. XV. and XVI. respectively.

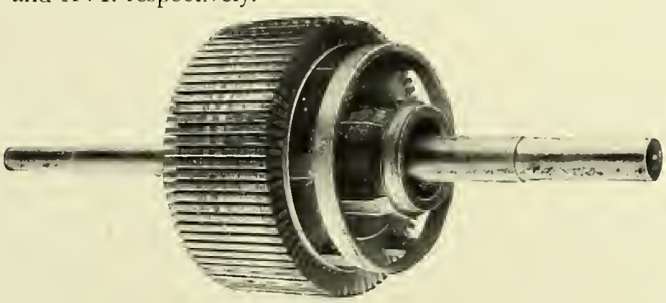


Fig. XVI.

The Armature Coils are given special care in regard to their formation and insulation. They are first wound on forms, then carefully taped and dipped in special insulating varnish. After being thoroughly dried, they are then shaped, and each coil is tested separately for short circuits before being assembled.

These armature coils, Fig. XVII., are so accurately formed that they are interchangible, and thus facilitate the making of rapid repairs.

The slots of the armature core are fibre and mica lined, and when the armature coils are laid or assembled in them they are completely below the surface of this core, while the rear ends of the coils are protected by a fibre and mica lined metal head. This arrangement completely secures the windings from accidental injury, and at the same time allows of

perfect ventilation. Fig. XVIII. shows the end cap or metal head for protecting the windings, and Fig. XIX. shows the armature with coils completely assembled, ready to be soldered into the commutator.

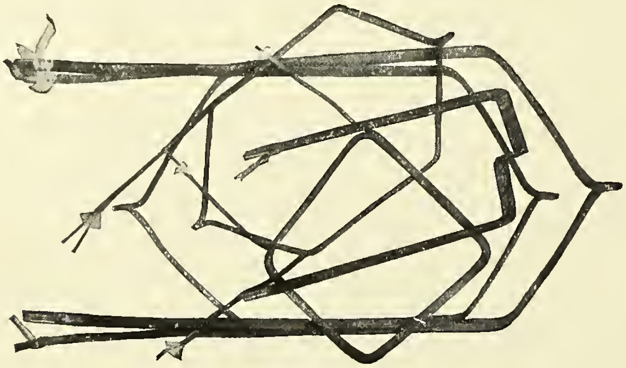


Fig XVII

The Commutator being one of the most vital parts of the machine, must be designed and constructed with special care. Three essential points should be kept steadily in mind; first, ample brush surface; second, homogeneity of bars; third, absolute rigidity of construction.

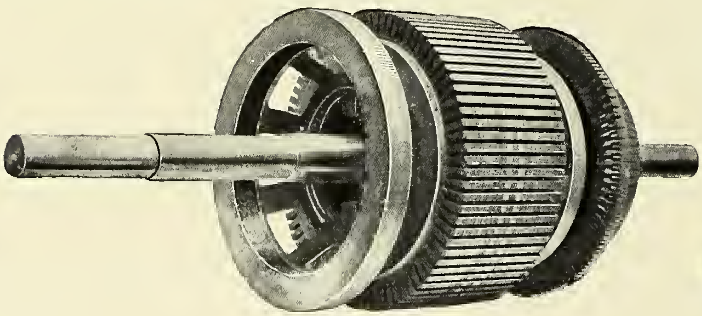


Fig. XVIII.

The Brush Capacity on all sizes averages about 25 amperes per square inch at full load. This low rate insures a cool running brush. The bars are made of the best quality of lake copper. The mica is cut from selected stock, a special grade being used for insulating the segments.

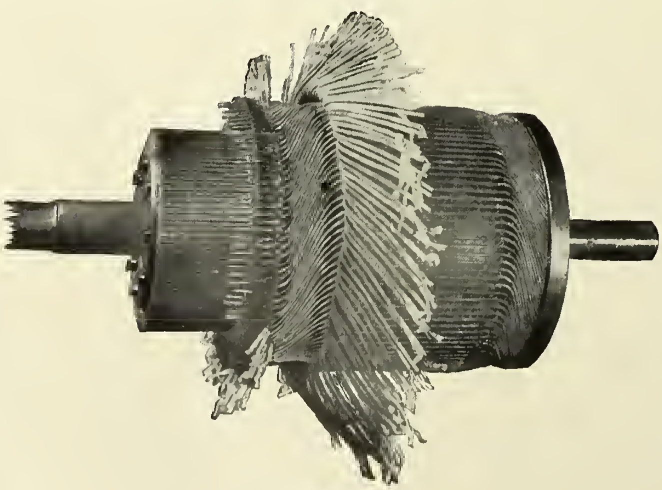


Fig. XIX.

Fig XX. represents the commutator shell. It will be noticed that it is of heavy construction, which is necessary, so that it will withstand the great pressure it receives in the mounting of the commutator bars, and so that it will hold them securely in place thereafter.

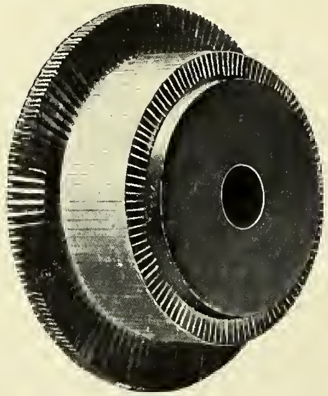


Fig. XXI. Commutator.

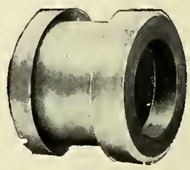


Fig. XX.

Another feature of importance is that each bar has an extended ear, thereby radiating the heat that comes from the commutator before it reaches the soldered connections where the armature coils enter them.

The above feature is clearly shown in the illustration of the complete commutator. Fig. XXI.

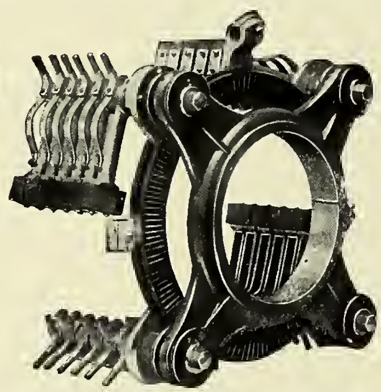


Fig. XXII. Brush Holders. 60 H.P. Motor.

The Brush Holders are of such a pattern that the carbons are held perfectly flat on the commutator, without any lateral or endwise movement whatever, yet, at the same time, they have a perfect adjustment for parallel feed. The current is conducted from the brushes to the stud through solid connections, no sliding contact intervening.

The Heat Limit is reduced to a minimum, due to liberal designing and rating, together with the special mechanical features for ventilation. After a ten hours' run at full load, a heat limit not to exceed 40 degrees F. in the fields, and 70 degrees in the armature, above the surrounding atmosphere, can be guaranteed.

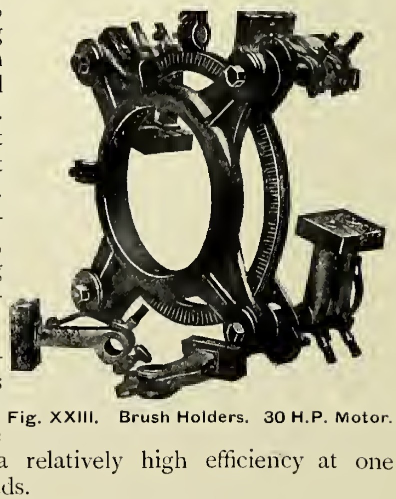


Fig. XXIII. Brush Holders. 30 H.P. Motor.

The Commercial Efficiency at full load, ranges from 84 to 93 per cent., depending upon the size of the machine, with a relatively high efficiency at one quarter and one half loads.

The Selection of Electrical Machinery. In buying electrical machinery, either dynamo or motor, deliberate judgment should be given to its selection. The requirements should be carefully studied and machines selected to fill these conditions. The aim in every installation should be three-fold, namely: Durability of apparatus, efficiency of operation, and simplicity of parts. If a motor is to be selected to run machinery, the first question to be decided outside of capacity is speed. It is nearly always desirable to belt from the motor direct to the machine to be driven, provided that it does not necessitate too small a pulley on the motor, and then spur or worm gear can often be used. In most cases the standard slow-speed motor is available for direct belting, and such a motor should be chosen in preference to a high-speed machine. The cost of the slow-speed motor is greater than the high-speed motor, yet this is more than counterbalanced by the additional daily expense of running a counter shaft, by the increased mechanical wear of the motor, and by the heat losses of the high-speed machine caused by the lesser weight of active copper and iron per horse power output.

The second question for decision is the nature of the load. Is the load to be intermittent with sudden and variable ranges, or is it to be constant? If of the former class, a motor should be chosen with a strong torque or starting power, and designed so as to reduce to a minimum the heavy rush of current consequent upon sudden loads. Such a machine is found in a compound-wound type with specially proportioned fields. A motor of this class should also be used where the requirements are such that a heavy load is to be started repeatedly from rest.

Special installations embodying exceedingly slow speed and minute manipulations of such speed, such as printing-press work, direct connected tools, etc., require specially designed motors and controlling devices, and in such installations the advice of an electrical engineer should be obtained.

The third question for consideration is the selection of a motor which will require the minimum amount of attention, and yet always be in good operative condition. Such a machine is one in which the mechanical design throughout is of simple and durable construction. By the observance of this condition not only is the cost of attendance reduced to a minimum, but agravating and expensive delays due to breakdowns are often avoided.

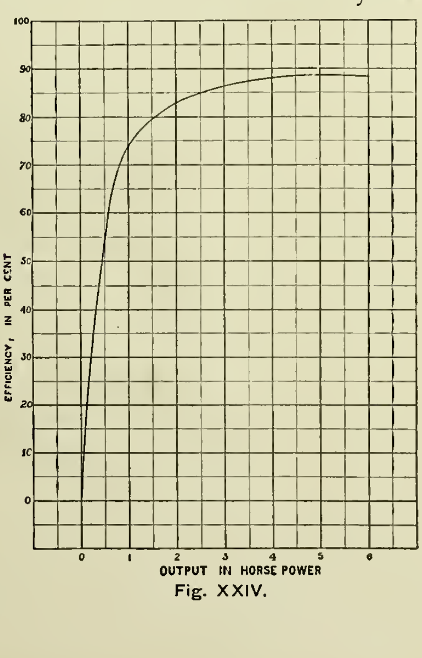


Fig. XXIV.

Suffice it to say, in general, that the best electrical machinery attainable is the cheapest in the end.

Figs. XXIV. and XXV. show the results of a test of such a motor as we have described in detail above, and from them and the remainder of the illustrations we have given, may be judged how far we have been justified in the selection of types.

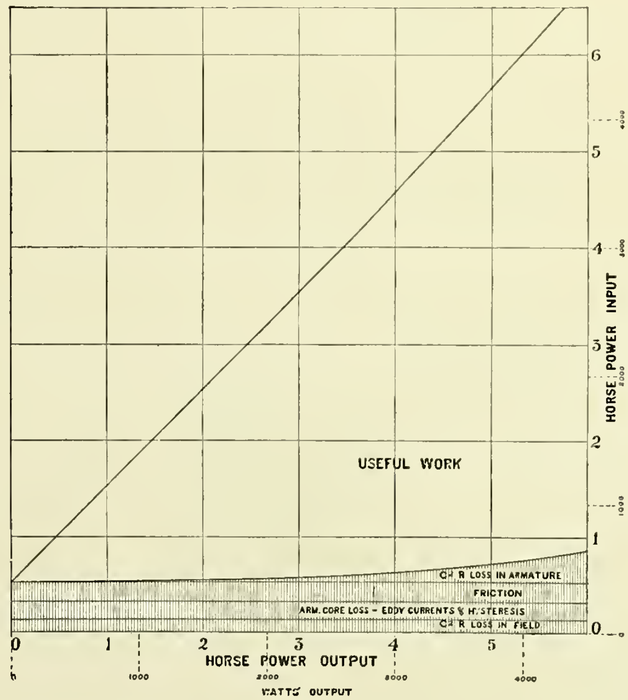


Fig. XXV

Emery Wheels and Machines.—We doubt whether there is any more useful tool in an engineer's shop than the emery wheel. Their manufacture and use have been wonderfully developed during the last few years, and they are now considered an indispensable tool in any workshop wherever the nature of the work has previously been done by files and similar tools. For instance, it is estimated that a man can drive a file at about 60 ft. per minute over an iron surface, and it is soon worn out, but emery wheels are perfectly safe at 5000 ft. per minute, and last for years; the saving in files alone is enormous, to say nothing of the immense saving in time and tools which would be effected by using emery wheels.

The grains of emery are consolidated into wheels by a special process, which develops the cutting properties in the best possible manner, which ensures freedom from glazing, durability, and rapidity of cutting.

If required to work as a disc, an improved method has been adopted for securely fastening them to an iron plate: in addition to which a shield is fixed round, thereby rendering them safe at a much greater speed than when used on the periphery.

Fine discs made from flour emery are admirably adapted for setting plane irons, etc., being an excellent substitute for Water of Ayr stone, at half the cost, and last much longer.

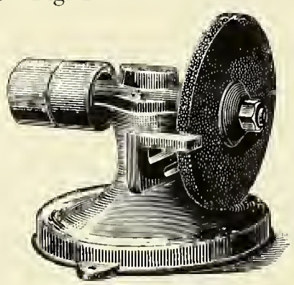
In mounting emery wheels, *flanges not less than half the diameter of the wheels* should be used, and with insertion rubber washers between the wheels and the flanges.

Emery wheels should be examined frequently, and also the bolts or set screws to see that they are screwed up tight.

If the above simple directions are carefully attended to, the following has been found to be the best and most effective speed at which to run these wheels.

6 in. diam. and smaller,	2500	revolutions	per minute.
7 in. to 9 in. diam.	2000	,,	,,
10 in. to 12 in. diam.	1600	,,	,,
14 in. diam. - -	1300	,,	,,
16 in. ,, - -	1200	,,	,,
18 in. ,, - -	1000	,,	,,
20 in. ,, - -	900	,,	,,
22 in. ,, - -	800	,,	,,
24 in. ,, - -	750	,,	,,
28 in. ,, - -	650	,,	,,
30 in. ,, - -	600	,,	,,
32 in. ,, - -	580	,,	,,
36 in. ,, - -	550	,,	,,

A very useful little machine intended to be used for light grinding, such as cutlery, saw machinery makers, etc., is illustrated below:—Fig. I.



Emery Wheel.—Fig. I.

It has a circular base and can be bolted down on a bench with two $\frac{1}{2}$ in. or $\frac{5}{8}$ in. screws. The shaft is steel, $\frac{3}{4}$ in. diameter, which runs in a bearing 7 in. long, and has fast and loose driving pulleys, 3 in. diameter by 2 in. broad, at one end of the shaft, and an emery wheel, 9 in. diameter by 1 in. thick, at the other end.

A double machine can be fitted up with two emery wheels, 12 in. diameter by $1\frac{1}{2}$ in. wide; it has $1\frac{1}{4}$ in. spindle, and fast and loose pulleys, 3 in. by $2\frac{1}{4}$ in. It will be found most serviceable, as one wheel can be made of coarse emery for taking off the burr of articles, and then by having a fine wheel on the other end, a fine surface can be obtained.

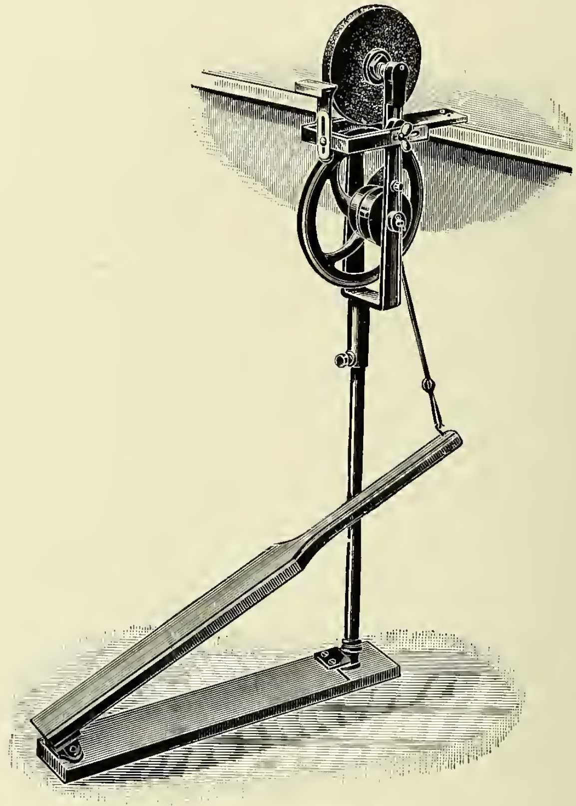
When an article is required to grind with water, the machine should have an iron cover and water trough, allowing the wheel to continually run in the water and preventing splashing; by the use of the water arrangement the grinding can be accomplished without destroying the temper of the tools.

Where power is not available, a very serviceable wheel is the foot treadle machine (Fig. II.) It can be fixed to a table or counter, and is capable of being driven up to a speed of 3000 revolutions per minute. A spring attachment keeps it always turning the right way.

In the pork, meat, and general provision trades, one or other of these wheels is simply indispensable.

Engines.—see Gas Engines, also Steam Engines.

"Enterprise" Meat Cutters.—These machines are made in Philadelphia, United States of America, and have a very wide circle of users; they have been shipped to nearly every country in the world. The principle on which the machines work is:—the meat is fed into a hopper and is carried forward by the feed screw or propeller and forced into the small holes of the plate. A four-bladed knife is fixed to the end of propeller and is carried round with it—each revolution of the crank making four cuts on each hole of the plate. The meat is then forced through the holes and falls in a mass in front of the machine. The size of cut is regulated by the size of holes in the plates, the standard size which accompanies each machine having $\frac{3}{16}$ in. holes.



Emery Wheel.—Fig. II.

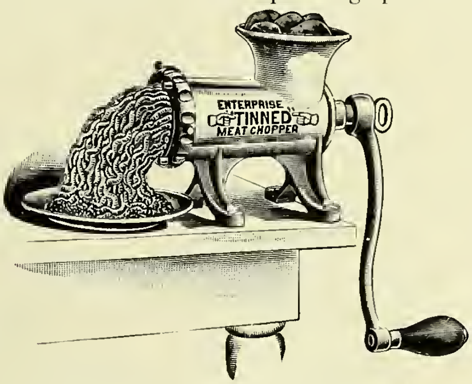
The manufacturers issue the following directions which should be closely observed so as to get good results.

1. Be sure the knife is in the chopper with flat side against the plate.
2. Do not attempt to sharpen the knife or plate. When dull, send them by mail to the factory for re-sharpening. *It is just as important for the plate to be sharpened as the knife.*
3. Always use the same knife and plate together (or in pairs). When not in use, keep perfectly dry to avoid rust.
4. Screw the ring up moderately tight so as to be perceptible when turning the crank.
5. Do not turn crank backwards.
6. See that the threads of the ring and on end of cylinder are kept free from meat.
7. A plate with $\frac{3}{8}$ in. holes is the most suitable for cutting hash.
8. In cutting tallow, first run through a coarse then a fine plate.
9. Oil the shaft occasionally.
10. When done using, clean the machine thoroughly.

11. When attaching clamp choppers to marble or iron counters, place a thin strip of rubber or leather under legs.

Directions 9, 10, *and* 11 *also apply to choppers Nos.* 0, 1, 2, 4, 6, 8, 106, *and* 108, *and food chopper No.* 100.

Enterprise meat cutters are made in a large variety of sizes from small household machines up to large power cutters.



Enterprise Meat Cutter for Hand.

With regard to the power sizes the makers claim that—

They do not heat or discolour the meat.

They are absolutely noiseless.

They economise power.

Ice can be worked through them.

They do the work much more rapidly than other machines.

They do not grind or tear the meat, but cut it as with a pair of scissors. Strings, sinews, and gristle cannot pass through without being chopped.

They are easily cleaned.

All parts are interchangeable, the cutting parts being made of steel.

They can be used as Mixers, also for reducing stale bread and crackers for second use, for cutting Paraffin wax and generally for reducing all classes of Plastic and yielding substances.

Directions for Setting Up and Operating.—See that the machine is in line with the driving pulleys. Be sure that the engine and machinery connecting it to the driving shaft are of sufficient power, and the pulleys of the proper diameter to give the necessary speed. To be sure that the belting is in line, remove the feed screw, knife and plate, and run the the machine a short time without any meat in it. See that the journals are thoroughly oiled before starting and keep them so while running. Use pure lard oil.

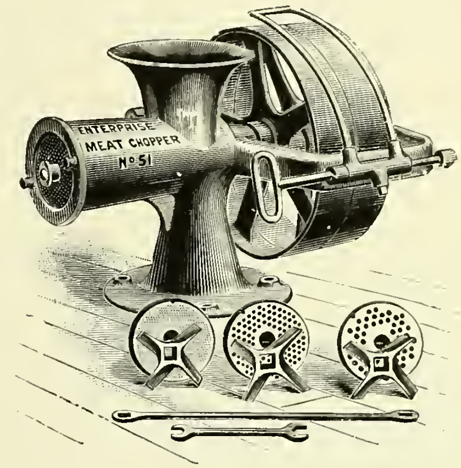
Be sure that the knife is in the chopper with the flat side against the plate. Do not attempt to sharpen the knife or plate. When dull, send to the factory to be re-sharpened, as special machinery is required for the purpose. An old plate when re-sharpened can be used with a new knife or vice versa.

Feed the machine regularly and steadily and keep it well supplied with meat. Otherwise the knife is apt to break and the knife and plate wear un-necessarily. The seasoning should be added after the first chopping and before passing through the fine plate.

Beef or tallow should first be run through the coarsest plate ($\frac{3}{8}$ in.), and then repeatedly through the fine plate until it is as fine and sticky as desired. Pork will be fine enough to suit most tastes after chopping once through a plate with $\frac{1}{4}$ in. holes.

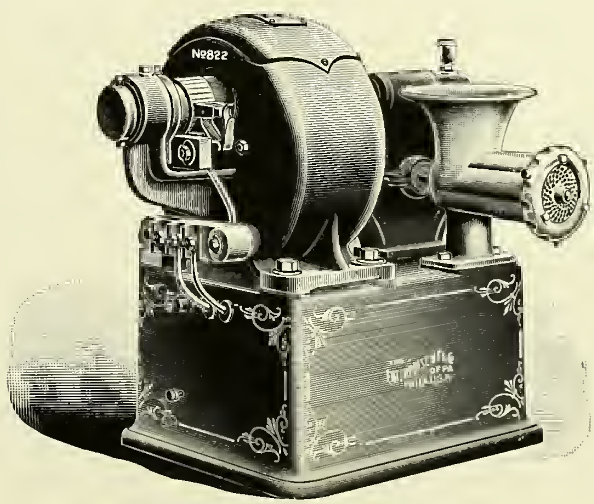
Always use the same knife and plate together (or in pairs). When done using, clean and dry them thoroughly and tie or put them away together so that they cannot become separated.

Screw the ring up moderately tight. On no account use any other lever than the one sent with the machine. See that the threads of ring and on end of cylinder are kept free from meat.



Enterprise Power Meat Cutter.

Taking advantage of the development of electricity as a motive power, the Enterprise Co. have produced combinations of meat cutter and electric motor to which it is only necessary to connect the current, thus avoiding the necessity of taking up space by having a separate motor with belting between.



Enterprise Meat Cutter with Electric Motor Combined.

Epping (Beef) Sausage.—

23 lbs. beef.
7 ,, pork, back fat.
8 ,, bread, soaked and pressed.
4 ozs white pepper.
13 ,, salt.
$\frac{1}{4}$ oz. ground nutmeg.
$\frac{1}{4}$,, ground ginger.
A wine-glassful of bi-sulphite of lime.
(Sausage meal or pansitose may be used instead of soaked bread).

To be chopped fine, filled into hog casings and bundled up six links to the lb. Larger or smaller choppings in proportion.

Epping (Pork) Sausage.—

30 lbs. pork (fat and lean).
8 ,, bread, soaked and pressed.
13 ozs. salt.
4 ,, white pepper.
¼ oz. ground mace.
A wine-glassful of bi-sulphite of lime.
(Sausage meal or pansitose may be used instead of soaked bread.)

To be chopped fine, filled into sheep casings and bundled up eight links to the lb. Larger or smaller choppings in proportion.

Essences.—Spices and herbs used for flavouring purposes owe their special properties to the presence of what are termed essential or volatile oils. These oils have the property of evaporating away completely when dropped on paper leaving no mark, while the fixed oils, such as linseed, colza, etc., leave a permanent greasy stain. The volatile oils are extracted by distilling the herbs, spices, or flowers containing them, by boiling them with water, when the volatile oils pass over as vapour with the steam and are condensed in a suitable apparatus. Some oils are extracted by pressure, *e.g.*, oil of lemon is extracted by rubbing the skins of the lemons with a sponge and squeezing out into a vessel.

The term essence is usually applied to a solution of the essential oils in spirit. The process is simple; the crushed herbs or spices are steeped in diluted rectified spirit for ten days or a fortnight, and the solution is filtered through blotting paper and is then ready for use. Instead of the herbs or spices, the oils extracted from them may be dissolved in spirit, and in this way an essence may be made in a few minutes. Another method is to distil the herbs or spices with spirit and water.

Experiments in Pig Feeding in Victoria.—see Victoria (Australia).

Exports of Perishable Products in Victoria.—see Victoria (Australia).

Eye Pieces.—see Pigs' Heads.

FACTORY (Bacon). — see Somersetshire Bacon Factory, also Yorkshire Bacon Factory.

Factory (Butter).—see Welsh Butter Factory.

Factory (Sausage). — see Model English Sausage Factory.

Faggots.—The following is a recipé for making these :—

10 lbs. lungs.
6 ,, scraps of meat, pork, etc.
5 ,, stale bread (ground up) or sausage meal.
3 ozs. food preservative (dry antiseptic).
½ lb. chopped onions.
12 ozs. seasoning.

Seasoning— 1 lb. black pepper.
½ oz. cayenne pepper.
1 ,, rubbed sage.
1 ,, rubbed thyme.
¾ lb. salt.

(Keep this seasoning in tins, tightly covered up and ready for use).

Another recipé is as follows :—

Gather together all sundry pieces available—scraps of any odd kinds—boil till tender, chop finely and season rather highly, roll into balls, and envelope each ball in a piece of caul fish, pack closely together in baking tin and roast in good hot oven till fat boils out—this point is important to prevent sourness. Seasoning must be carried out with discretion, as allowance must be made for stock used which may have been previously seasoned. The most savoury seasoning ingredients are marjorum, cayenne, sage, black pepper, and salt.

False Liver Sausage.—see Liver Sausage.

Fans.—see Ventilating Fans.

Farina.—A starchy flour made from potatoes, manufactured largely on the Continent of Europe. The potatoes are first washed by machinery, then grated down with raspers and reduced to a paste with added water. The fibrous part of the potato is removed by agitation and sieving, while the starch paste is conducted to settling tanks where it deposits and is washed with pure water. It is afterwards conducted along a wide shoot or inclined plane where the starch settles and is once more washed. Sulphuric acid and alum are used in separating the remaining albuminous portions. The starch is dried on slabs of gypsum or bricks of a porous nature, and when necessary is often finished in a hot chamber.

Farina, like other starches, is only slightly soluble in cold water, but in hot water it forms a thick paste, which when cooled resolves itself into a firm jelly.

The structure of starch forming plants is very interesting, the leaves decompose carbonic acid by the help of the sun—evolving oxygen in the process and forming starch; by the action of fermenting diastase this starch becomes converted into sugar, which passes from the leaves to the tubers where it is re-converted into starch and stored.

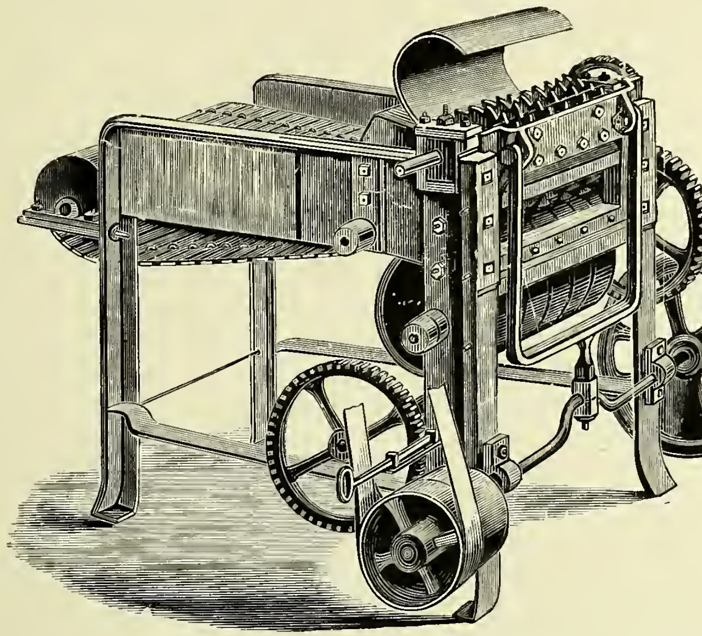
An outstanding peculiarity of starch granules is, that when it is drawn and pressed between the finger and thumb a slight crackling sound is noticeable.

Farina or potato starch is one of the most popular substances used by the makers of German, Bologna, and other sausages. It has a powerful effect in absorbing and binding, and holds the ingredients with the moisture and fat together in such a way that a firm nicely cutting sausage is the result.

Fat Cutter.—see Brawn Meat Cutter, also Alexander Fat Cutters.

Fat and Refuse Cutting.—This cutter will cut large quantities of fat and refuse fatty matter from slaughter and packing houses in as short a time as possible and save labour and material. The object of this machine is to prepare the fatty matter used in the manufacture of lard and tallow by cutting it into small pieces for the rendering tanks. Of such product this machine will cut up an immense quantity on account of its superior construction, its capacity being about 100 lbs. per minute. The uniformity of its work reduces the crackling cake at least six per cent., which is a corresponding gain in clear fat.

The machine consists of strong iron frame work, supporting a cutting device of circular saw knives and a grooved drum. These saws and drums revolve toward one another, the



Heavy Fat and Refuse Fat Cutter.

edges of the knives projecting into the grooves of the drum. In connection with the drum is an endless iron apron passing over two rollers, which receives the fat and carries it toward the saws, which in turn catch the fat and cut it into strips. The strips of fat are then caught and cut transversely by the reciprocating motion of a vertical, adjustable knife, thus reducing the substance to uniform pieces of about one and-a-half inch cube. A scraper projecting from the frame and between the saws and roller frees them from any adhering fat. A suitable shoot in front of the machine discharges the cut fat.

These machines are made in two sizes, and weigh respectively 1200 lbs. and 850 lbs. Capacity of No. 1 machine is 100 lbs. per minute, and that of No. 2 about 60 lbs. per minute. Floor space 5 feet by $3\frac{1}{2}$ feet.

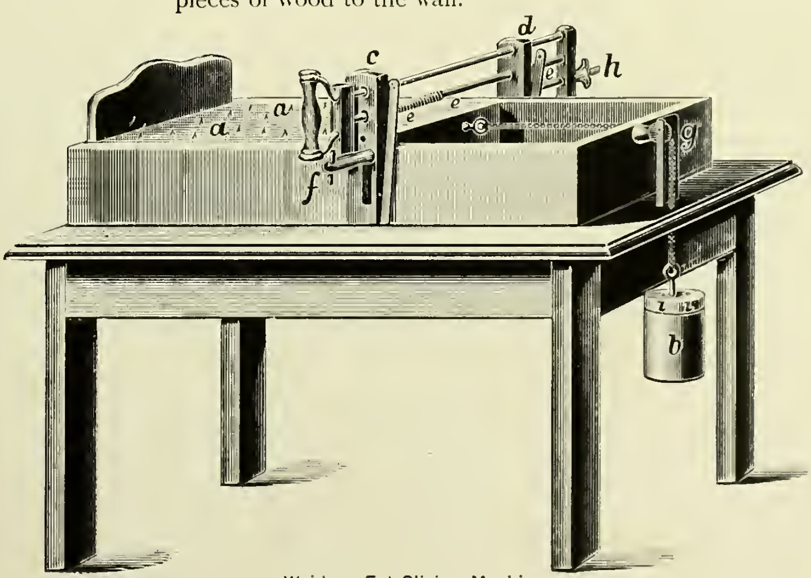
Fat Cutter for Cutting Thin Slices of Fat.—The Weidner machine is described by the makers as follows:—

Use of the Slices of Pork Fat.—The slices are indispensable for wrapping round the finer kinds of sausage goods, for making into rolls of all sorts for mosaics, gelatine from poultry, for decorating cheese moulds, for putting round salmon, for use in hotels for dressing poultry, partridges, turkeys, etc.

Utility and Advantages.—While, up to the present for cutting bacon into slices only the best skill was required, this machine can in consequence of its extraordinarily simple construction be worked by anyone, and it requires no particular knowledge or ability to understand it. Moreover, this machine has the advantage of giving a clean cut right through at the same time cutting the slices into uniform pieces, leaving no chippings behind, and sides of bacon can be cut without any trouble whatever, down to the skin. This apparatus, therefore, not only saves the pork fat but also time, for it can cut almost twice as much in the same time as formerly.

As the fat must be soft, if found to be too hard, it is stored the day before in a warm place. It is better to have salt bacon fat as it lasts longer in the summer. If the skin is too dry, as is very frequently the case, when the bacon is too dry-salted, it is advisable before using same to moisten it, and this is done in the following manner:—take a pot of warm water and pour it over a table, so as to well moisten same, and then lay the bacon upon it. The skin very quickly attains the softness necessary without any influence whatever on the bacon itself, and presents a fine glossy surface, so that the piece of bacon can be laid firmly on the sliding board. If the piece of bacon fat is not soft enough it will arch in the apparatus, and this makes the cutting very difficult, particularly when only a thin layer of bacon fat remains. The bacon must therefore be neither too hard nor too soft.

Working of the Apparatus.—After having drawn out the sliding drawer A by means of a cord connected to it by a pulley turning on a weight, the drawer is drawn back again and the bacon placed upon it. The bacon must be the breadth of the whole sliding drawer stretched out as far as possible, so that the skin on both sides is pressed under the projecting iron band. The little points of steel fixed in the board prevent the moving to and fro of the piece of bacon fat. According to the height of the bacon fat, and to the thickness of the slices to be cut, the knife in the holders C and D are arranged as wished, and these holders are screwed up at the point F on both sides of the machine. The knife at point F is screwed up according to the greater or less softness of the bacon. It is the same with the putting into position of the plates of the weights as is evident in point I. Now begins the cutting of the bacon after having first connected the sliding board by means of the cord, with the weight. The knives work with quick short movements and must be very sharp. The iron brackets are so constructed that they can be fastened with pieces of wood to the wall.

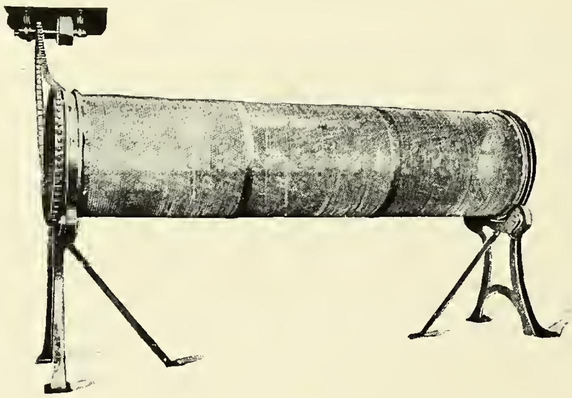


Weidner Fat Slicing Machine.

The machines supplied with tables can be placed anywhere according to choice, by means of fixing a piece of angle iron on the foot or by means of hoop iron placed crosswise on the underside of the table and fastened to the ground or wall.

Fat Pork, to cure.—see Pork.

Fat Washer.—An American machine used for washing the fat from pigs, or oleo and other substances. It supersedes the old method of washing by hand, as the work can be got through at a rapid rate. It is a cylinder built of iron with a wire screen wrapped around it. The fat or other substance is rubbed against the sides and undergoes practically the same process as by the rubbing board used in hand washing. The proper speed for it working is eighteen revolutions per minute



Fat Washer.

Favus in Poultry.—The Board of Agriculture issue the following particulars of this disease :—

Favus is a disease produced by a minute parasitic fungus known scientifically as *Achorion Schœnleinii* (Remak). This fungus attacks the comb, wattles, and neck, etc., of birds, and causes the feathers of the latter to fall off; sometimes one side only of the neck may be affected, becoming quite deplumed, whilst the other shows so signs of invasion; but, as a rule, it is the comb that suffers first and most from the attack.

Tinca favosa is common to man, the cat, dog, and rabbit, and is particularly prevalent in rats and mice. It is rarely met with, however, in human beings in this country.

It is very destructive in poultry-yards, and, being highly contagious, often spreads with great rapidity. A single diseased cock soon contaminates the whole run, and several outbreaks have been traced to a new male bird from an affected yard.

The first signs of an attack of favus are small, pale, irregular, cup-like spots on the comb or wattles, generally appearing on the comb first. These spots grow together, and sooner or later form a confluent covering of a dirty yellowish-grey substance, which is often arranged in concentric layers. These crusts often grow to a considerable thickness. When they are present on the comb or wattles there may be a complete and rapid disappearance of the malady; but when the feathered areas become invaded it is more persistent. Sometimes the breast, and especially the rump, is denuded by this fungus, which, when present on the feathered parts, usually ends fatally unless treatment is resorted to. The feathers become erect and dry and fall off, and leave the denuded skin covered with dull yellowish-grey crusts, showing here and there depressions from which the feathers have fallen. The fungus may easily be observed by scraping the diseased surface, or the skin under the crusts, and examining the debris under the microscope. It will then be seen to consist of a number of fine threads (the mycelia), and numerous spores, sometimes nearly the whole mass being composed of the latter. To examine the fungus, the debris from the skin and crusts should be put on a slide, and then moistened with distilled water and a little acetic acid.

Nearly all breeds seem equally susceptible, but the disease does not appear to have occured in Indian game; it is said that fowls of Cochin China descent are most liable to it.

Care should be taken in handling patients, as the disease can be transmitted to man, on whom it is not so amenable to treatment as in birds. It is probable, however, that the disease can only be planted either naturally or artificially on an abraded surface.

Treatment.—The treatment consists in bathing the invaded parts with warm water and soft soap, and then applying some ointment to destroy the parasite. Nitrate of silver well rubbed into the comb and wattles has been found of great benefit; an ointment of 5 per cent. of the nitrate of silver in lard may be used for this purpose. Red oxide of mercury one part, to lard eight parts, has proved an excellent remedy if used for several days. A correspondent of the Board of Agriculture advises "powdered zinc, copper, and iron rubbed on the damp comb." Thymol has also been mentioned as a possible remedy for favus, as it has been used successfully in treating ringworm, a somewhat similar parasitic disease in the human subject.

In any case, it is most essential to well foment the diseased parts previously to applying the ointment, and to remove as far as possible all the favic crusts with a blunt knife. One cannot be too careful in examining a fresh bird before turning it into the run, which, needless to say, should not be done if any signs of "favus" are noticed upon it.

Should the disease appear, the bird should be at once isolated and treated, as when the parasite reaches the feathered parts it is so much more difficult to eradicate.

Federation of Grocers' Associations of the United Kingdom.—This institution was established in 1891, and is composed of grocers', provision dealers', and oilmen's associations throughout the United Kingdom. These latter associations are formed for the carrying on of the work of protecting their members locally in all matters affecting their trade interests. They affiliate with the grocers' federation, which deals with all matters of trade protection from a national standpoint, including Parliamentary matters, trade customs, defence of members of affiliated associations where trade interests are involved, arbitration in questions of dispute, whilst the federation also has a special department for the insurance of its members against accidents to employees, and the liability of members of affiliated associations to the public for accidents caused to them. It is an organisation which now includes 120 affiliated associations, the aggregate membership of which is estimated at about 16,000. It has taken a prominent part in such questions as the amendment of the adulteration laws, weights and measures laws, and other matters, whilst it has also established a very powerful benevolent fund for

the relief of necessitous members of the trade. This was started in the diamond jubilee of Her late Majesty, and already has about £10,000 invested capital, with five pensioners, whilst during the year 1901 an effort is being made to raise the sum of 10,000 guineas as a fund in memory of Her late Gracious Majesty, Queen Victoria.

Mr Arthur J. Giles.
Secretary to the Federation of Grocers' Associations.

Meetings of the federation are held annually in various great provincial centres, whilst the general business of the body is conducted by meetings of a committee held once a quarter, which last about three days. The secretary is Arthur J. Giles, Ceylon House, 49 Eastcheap, London, E C., from whom any information can be obtained.

Feeding Meal.—see Paisley Feeding Meal.

Filled Boar's Head.—Choose the head of a black pig, remove the bristles by holding over a fire; prepare the head as in Nos. 1 and 2. Fill with 40 lbs. of lean boiled pork, 12½ lbs. raw veal, 12½ lbs. raw fat pork, all the lean meat from five roasted geese, 35 lbs. goose liver, chop together, season with 28 ozs. salt, 3 ozs. ground cardamoms, 3 ozs. grated nutmeg, 12½ lbs. truffles, 30 raw eggs. Fill the head and cook as in No. 1. Decorate without pouring the warm lard over the whole, merely using the paper funnel.

Filled Hog's Head, No. 1.—Choose a young hog that has been killed by being stuck with a knife, scald in water not too hot, or the skin will suffer; clean well from hair, cut the head from the body, leaving the neck on, skin the rind from the neck and head leaving half-an-inch of fat on the rind, cut the lower part of the mouth, and a small part of the nose away. The sewing together of the head had better be done by a saddler. Stuff with 30 lbs. of boiled pickled pork, 25 lbs. raw pork from the shoulder, 18 lbs. of veal, 13 lbs. of fat pork, 14 lbs. lean beef, all cut in large pieces; season with—

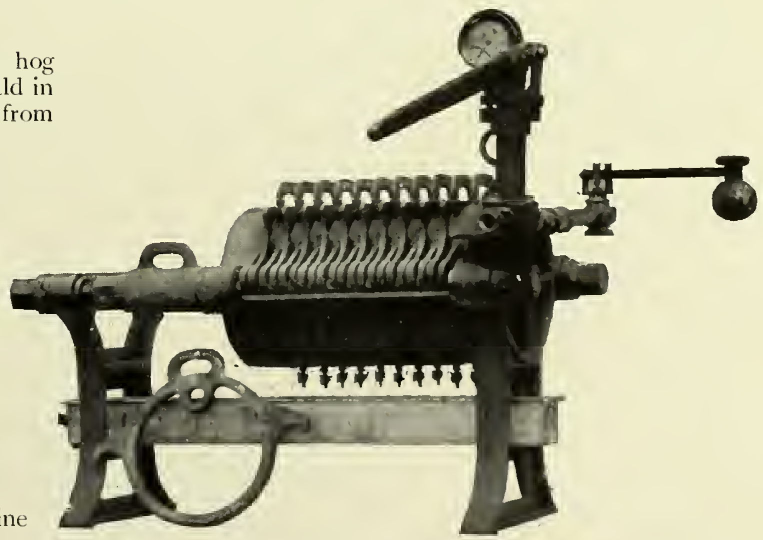
26 ozs. salt.
26 ,, ground pepper.
24 ,, cut garlic.
2 onions (cut fine).
4 raw eggs.
19 ozs. pistachio nuts (boiled in 1 qt. Rhine wine 15 min.)—add the wine when cool.

When well mixed, take 24 hog tongues, or the same amount of beef tongues, cut into long thin slices and divide among the filling, fill the head and sew up the opening; the above amount will stuff four ordinary hog's heads. Tie the head tightly in a clean white cloth, being careful to keep the shape of the head. Boil 1½ hours. Cool in cold water for ten minutes. After 24 hours remove the cloth, it is then ready for trimming, which may be done as follows:—pour over the head with a spoon, soft but not too hot lard (this must be done in the cold), the first coating can only be put on very thin; when perfectly cold fill a funnel prepared of paper (the hole in the lower end being left the size of a knitting needle), with melted lard, about half full; close the top of the funnel and squeeze the lard out of the lower end in a tiny stream; decorate as wished, the cooling lard making the desired figures. If wished, a little pulverised sugar, either white or coloured, may be sifted over this. Lastly do not fail to enclose glass eyes.

Filled Hog's Head, No. 2.—This differs from No. 1 in nothing except the filling, which is made by chopping 35 lbs. lean pork, 25 lbs. veal, both previously cooked; 25 lbs. raw fat pork, and 15 lbs. cleaned sardines. Season with 23 ozs. salt, 9 ozs. ground pepper, 1 oz. cardamoms, 34 ozs. sweet pine kernal and pistachio, which have been previously boiled in two bottles of Rhine wine, add the wine when cold. Add 24 chopped eschalots, previously fried in butter, and 24 raw eggs. After the whole is well mixed, divide through it four beef tongues and 5 lbs. cooked pickled hog's neck cut in thin slices. Fill the head and proceed same as in No. 1.

Fillers.—see Sausage Fillers and Stuffers.

Filter Presses.—These are appliances consisting of a frame into which are placed a number of plates or discs lined with cloths, and they are meant for filtering fluids or semi-fluids under pressure. The pressure is supplied by pumps, and the material is forced through the cloths, the clear filtrate running away at an outlet and the solids remaining behind in the cloths. There are many forms of these.

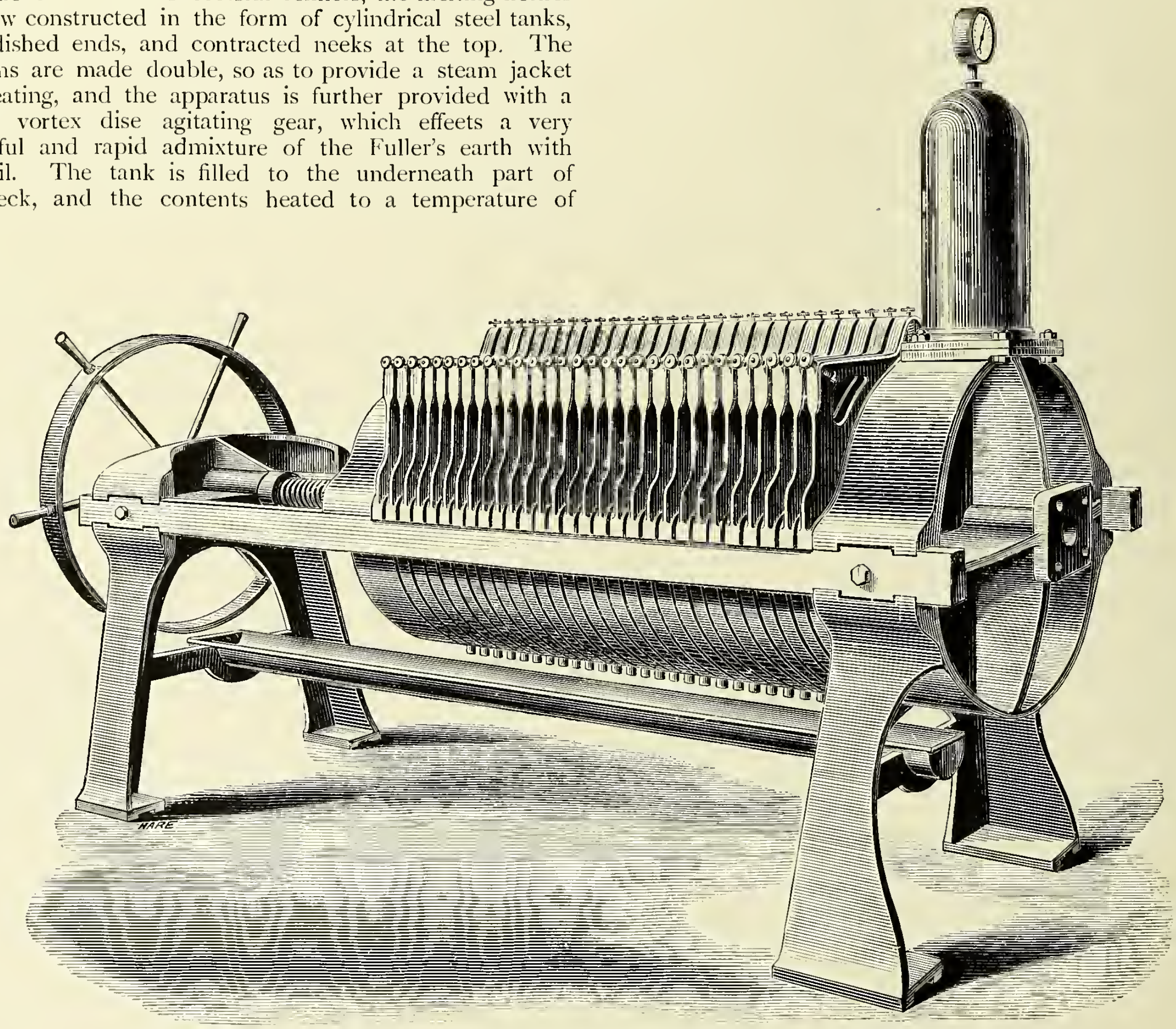


Hand Power Filter Press.

The filter press is used for elarifying fats and oils, and freeing them from sediment. To attain this a proportion of Fuller's earth is added, and this acts as a deodoriser and clarifier. Fat is just melted or rendered at a low temperature mixed with the Fuller's earth, and pumped through the frames of the filter press. The following is a description of the application of the process to various uses :—

On Treatment of Oils and Fats with Fuller's Earth.— Following the most improved method, and that employed by some of the most successful refiners, the melting kettles are now constructed in the form of cylindrical steel tanks, with dished ends, and contracted neeks at the top. The bottoms are made double, so as to provide a steam jacket for heating, and the apparatus is further provided with a patent vortex dise agitating gear, which effeets a very powerful and rapid admixture of the Fuller's earth with the oil. The tank is filled to the underneath part of the neck, and the contents heated to a temperature of

When treating oils or lard, whieh are to be used as food, it is very important to remove the Fuller's earth from them as quickly as possible after the mixing, and also that the mixing should be effected as rapidly and thoroughly as possible. For this reason, and so as to keep up a eonstant supply of the oils and fats and keep the filter at work, it is preferred to have the kettles worked in pairs on the twin system, *i.e.*, whilst one kettle is being used to feed the oil filters, the other is being prepared and treated with Fuller's earth.

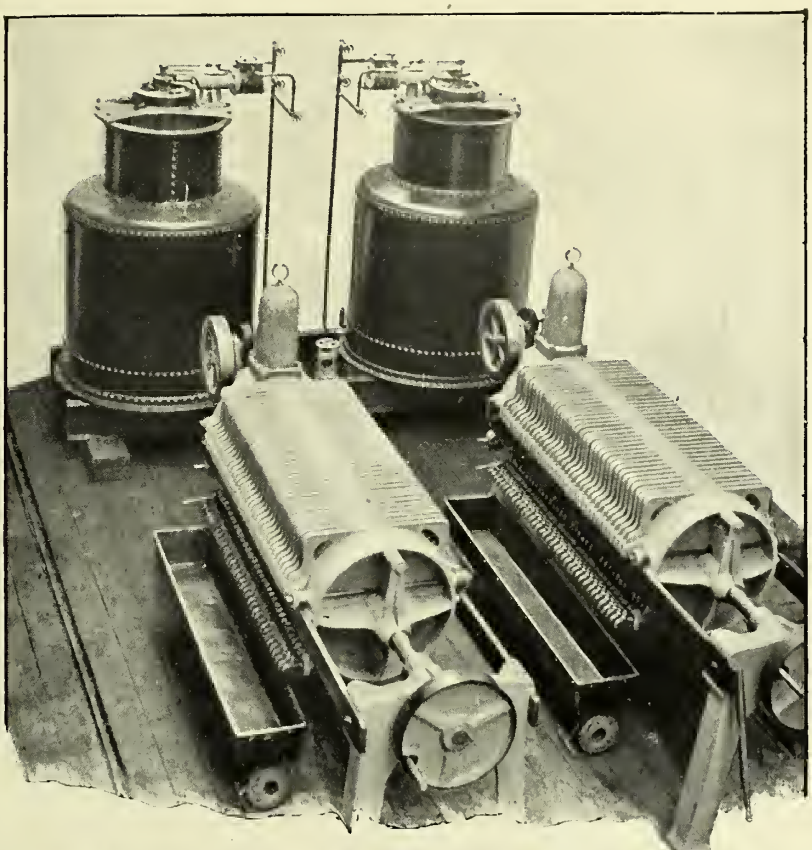


Large Power Filter Press.

150°-180° Fahr. The temperature is important. The vortex mixer is kept in motion whilst the oil is being heated, and as soon as it arrives at 150° the Fuller's earth is added, eare being taken that the proper quantity is employed. It should be ground to a *very fine powder* (earth speeially prepared for this purpose) and ought to be quite dry and free from moisture. This is most important. Three to five per eent. is the amount generally used, but of course the quantity would depend on the amount of colour to be extracted. This the refiner can test by experiment, by heating a small quantity and filtering it through filtering paper in a heated tin funnel before eommencing.

If the Fuller's earth remains any length of time, say over fifteen minutes, it commences to impart a taste to the oil or lard, and is objectionable. Such greases, oils, etc., should be kept at a lower temperature. The best temperature to employ can be readily found by experiment.

After the proper quantity of Fuller's earth is thoroughly mixed, the whole of the contents of the mixer are pumped by a steam pumping engine into the filter press. It should be noted that kettles made to hold very large quantities are objectionable, as the Fuller's earth remains too long in mixture with the oil, and imparts an earthy taste by the time the the filter is filled with cake. The filter is so



Bird's Eye View of Plant for treating Lard, Cotton Seed Oil, Cocoanut Oil. etc.

Seed Oils.—The use of these filters, in conjunction with the Anglo-American presses, has been found to be very advantageous, avoiding the loss of time and storage space necessitated by the old plan of subsidence; and in addition to this it also avoids the production of "foots," so that the sole products of the oil mills are bright oil and cake, the residue from the filter being worked back again in the kettle. When working on linseed oil, for instance, a 36 in. filter with 36 chambers has been found capable of passing with facility 20 tons of oil per day, and may be kept in daily use without opening for a week, or until upwards of 100 tons of oil have passed through the machine. If the machine is allowed to stand for about three hours, the cake collected on the surface of the filter cloths can be detached with facility and returned to the kettle. This machine on being screwed up is again ready for work. In mills where this system is in use the oil is sent away straight from the filter without storage, thereby saving considerably in time and capital. The best sized machine for this purpose is 36 in. diameter, and is supplied either with 18 or 36 plates, corresponding to a daily filtration of 10 and 20 tons respectively, and the respective weights are 9000 lbs. and 14,000 lbs. The whole machine being self-contained requires no foundation and is easily fixed, requiring only the attachment of the steam piping to put it in working order. The machines are frequently supplied with an additional pump to take away the oil as fast as filtered.

proportioned to the work to be done as to have a cake that will not be quite formed, a hollow cake. Steam is admitted into the centre feed channel of the press, and it finds its way into each of the hollow cakes. All of the cocks are shut off, except the one farthest away from the head. The steam passes through the centre of the press and first steams out the cake next the follower. When the steam has blown through this cake so as to free it thoroughly from oil, it is shut off, and the next one opened; and so on, until all are steamed. When the press is opened to remove the Fuller's earth it falls out in powder on the floor, little or no oil being left in it.

In the case of some oils, such as castor oil, Fuller's earth does not answer as well, and in such cases finely powdered animal charcoal or else wood charcoal, in fine powder (willow charcoal being preferred) is used. It is important also that the temperature should be raised to about 150°-180° in these cases also; in fact the animal or wood charcoal may be used in lieu of Fuller's earth, the same precautions as to dryness and fine powder being observed in these cases.

Care should also be taken where the oils are viscid, such as castor oil, linseed oil, etc., that the room where the filter is situate be artificially warmed, so that the whole mass of metal in the filter may be heated up to the temperature at which it is found best to work. In the case of linseed oil this should not be less than 90° Fahr. With castor oil it should be higher still.

Filters are also made with each of the plates steam jacketed, so that the contents of the oil filter can be maintained at any temperature required. These are used for treating solid fats, such as wax, paraffin, vaseline, etc.

Fish Oils.—These filters are now in use in most of the fisheries on the coast of Norway, Newfoundland, and Japan, and the new method of "cold clearing" such oils as cod liver oil by filtering them in winter at a temperature below 32° F. has quite revolutionised the industry.

Animal Oils.—For filtering tallow so as to effect a preliminary separation of the oleine from the stearine by allowing the melted tallow to cool to about 70° F. and become granulated and then filtering with these filters, they are found far more manageable and economical in saving labour than the old plan of pressing the magma in cloths under the hydraulic press. They are also used for filtering horse oil and in the process of cold clearing such oil, so that for fine purposes they will remain clear at 32° F.

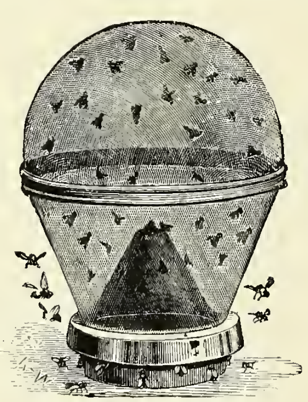
Mineral Oils.—Many of these filters are in use in the United States for collecting paraffin scale from mineral oils; they are also used for purifying and decolourising vaseline from Russian petroleum; for some of these purposes filters have been supplied working up to 600 lbs. per square inch.

Flake or Flear.—The first quality of fat in pigs. It surrounds kidneys and hence is termed kidney fat.

Fly Powder.—A composition of several antiseptic powders made by a special process, for preventing flies blowing meat. It is simply dusted over the meat from a perforated box or flour dredger, and the flies seem to have a positive

aversion to it. It is quite harmless and besides keeping the flies off, has a decidedly preservative effect on the meat; it is also flavourless and in no way affects the meat adversely. It is made usually in a white powder, but can also be obtained in a brownish powder to harmonise more with the the colour of the meat.

Fly Trap.—Fly traps are a most essential equipment of a shop in summer weather. There are many different contrivances for trapping flies, but a most ingenious contrivance is what is known as the balloon fly trap. It is formed of wire gauze, spherical shaped, dividing at the centre; the bottom half has a dome with a hole in the pinnacle, and the trap sits on a circular wooden block on which some sugar and vinegar is placed as bait. The flies make their way in from underneath by an opening round the circular block, and after having taken their sip of vinegar and sugar, they immediately proceed to leave the banqueting chamber by way of the pyramid, and of course find themselves caught. They never seem to attempt a return by the road they came. It is quite usual to catch hundreds of flies in an hour or two



Balloon Fly Trap.

with one of these traps. All that is then left to be done is to dip the apparatus into water and thus drown the catch, then divide the trap at the centre and clean it out; re-set it, and it is ready for work again. It is a good plan to have a series of these traps in various positions in the shop, so that the flies have not to travel too far, as they are not unsightly like many fly catchers.

Flour (Wheaten).—The most popular of all flours and is what the life of man most depends on. Wheat, from which it is made, is a cereal grown largely in this country, the South of Europe, the regions round the Black Sea, India, America, and many other places. A medium temperature is the best climate in which to grow wheat, as it rarely flourishes in either tropical or high northern latitudes. Wheaten flour is principally used for making bread, biscuits, and such like articles of food, and this forms the basis of biscuit and sausage meals, ham dressing, etc. The art of making bread from flour is one which requires a considerable amount of judgment, owing to the great variety of wheats, making it absolutely necessary to blend the different kinds of grain together; and it is here the brains of the miller operate. In proportion to the miller's ability to properly mix his grains does the result show in the produce of the flour. Flour when made into bread usually takes about three-and-a-half to four hours to digest in the stomach.

The extent of the trade in this country may be judged by the milling returns for 1900—27,810,727 sacks of flour of 280 lbs. each were manufactured by British millers. Of this, 7,223,087 quarters of wheat were grown by British farmers, while 15,952,519 quarters came from abroad, principally from the United States and the Argentine Republic. In addition to the above, 8,456,309 sacks of flour were brought into this country in the manufactured state.

In 1891 the quantity of flour entered at the Port of London was 2,291,200 sacks, while in 1900 it had risen to 3,044,000 sacks. Wheat shows a tendency to diminish in the imports and the manufactured article keeps steadily increasing. If we take the average for twenty-five years, we find that the importation of wheat for 1900 was 17½ per cent. below, while foreign flour was about 40 per cent. above the average. It is of interest to look back a century and cull from the *Times* of 11th February 1801.—"Yesterday a Court of Aldermen was held at Guildhall, when the price of bread was ordered to be continued the same as last week. We are assured that a sample of wheat sold on Monday, at the Corn Exchange, at *Eight Pounds Ten Shillings* per quarter. And we are told that individual avarice will not be satisfied without a still higher price. There was a sale of 500 barrels of American flour on Monday, which sold at 106s. and up to 110s. per barrel, which is at the rate of 156s. per sack. Many of these barrels were bought for private families; but to such extremities are the bakers brought, that, to retain their customers, they were obliged to give this enormous price for flour to mix with their meal. The manufacture is almost totally suspended, as many thousand sacks of the statute meal are lying upon the wharfs unsold."

In the manufacture of flour, sharps, pollards, and bran are produced and are much used for animal feeding. Of these, bran is the most nourishing as the inner part of the scale acts like diastase in the conversion of starchy food. It is thus a great aid to digestion. Of late years general efforts have been made to put bran on the market, in such a way as to make it an appreciated food for man, and many of these efforts have been highly successful.

Food Preservatives.—In its widest sense the name implies every kind of substance used for preventing decay in food, although in recent years the name has been accepted as applying more to the borax compounds which have proved so harmless and effective. Antiseptics in one form or another, such as common salt, saltpetre, etc., have been used from the earliest times in the preservation of perishable foods, but many other substances have "had their day, and ceased to be," while boric acid preservatives have, because of their innocuousness, become the recognised type of harmless antiseptics.

It is interesting to recal some of the many attempts to preserve food in a fresh state; M. Garmel's system was to take meat as soon as it was killed, so as to take advantage of its absorbent qualities, and inject a solution of chloride of aluminum at 10° Baumé, into the carotid by means of a syphon whenever the blood had ceased to flow from the slaughtered animal, both extremities of the jugular vein being previously tied Nine to twelve quarts of the solution was sufficient for an ox. When the animal had been well bled and the injection skillfully performed, it was hardly possible to detect that the carcase had undergone any preparation. If it was intended to keep the meat for a long time it was further necessary to wash it with a mixed

solution of common salt and chloride of aluminum at 10° Baumé, then dry and pack into clean air-tight vessels and keep in a cool place, when it might be kept for years. All that was required to make it ready for use was to soak it in water for twenty-four hours, for the purpose of swelling the pores, when in appearance and taste it was equal to fresh meat.

Another system was the use of carbolic acid paper, which was made by melting five parts stearine at a gentle heat, and then stirring in thoroughly two parts carbolic acid, after which five parts of melted paraffin were added, and the whole well stirred together. It was all melted together and painted on the paper with a brush; the paper was then used for closely wrapping round the substance to be preserved.

It will be readily admitted that the foregoing and many similar contrivances although good in themselves, were not satisfactory, because of the great care required to make the preservation satisfactory, and the use of common salt made it necessary to employ such large quantities, that not only was the aroma of the food spoiled, but scrofula, scurvy, and other skin diseases were only too common as a result of its use.

It became a necessity to find some kind of preservative of a harmless nature, which should be much more powerful than salt or saltpetre, and which should not harden the meat or induce chemical changes; this was found in the shape of boracic acid and borax, as smaller quantities were found relatively more effective with no appreciable result in the flavour or appearance of the foods treated. Borax has been used for medical purposes since the 16th century, but it was left to the 19th century to establish its reputation. It was found to exercise a soothing influence on mucous membranes; it was further found to have an excellent effect in surgical cases, and indeed asserted itself as the finest antiseptic dressing in such cases. Experiments with food followed, when it was found that a half or three-quarter per cent. application did the work of a four to five per cent. application of common salt, and although boracic acid and borax have both been used to a very large extent for a generation and more as food preservatives, no authenticated case has ever been reported where injury resulted from its use in this connection. The only objections urged against the use of boric acid preservatives are founded on assumptions, and are of a more or less speculative nature.

Dr Redwood, Ph.D., F.I.C., F.C.S., emeritus professor of chemistry to the Pharmaceutical Society of Great Britain, has given it as his opinion that—

"One of the strongest arguments in favour of the use of boric acid preservatives, is founded on the fact that the better class of these preparations are capable of producing the required effect when added to articles of food in very minute quantities, and that when thus used, their presence is not perceptible to the senses, while at the same time the food itself retains its natural, physical and other characters. The action of the preservative is in the direction of retarding the spontaneous changes or decompositions to which many articles of human food are subject, especially in certain states of the atmosphere. When the preservative is judiciously applied, the decompositions referred to are so far checked as to admit of much good wholesome food being used as such, which would otherwise be wasted or consumed in an unwholesome condition, thus milk, which is an important article of food, is daily supplied to almost every household in all our great cities, and for that purpose is now, with great advantage, brought from agricultural districts often at considerable distances, could not be thus supplied in an unchanged condition in hot weather without resorting to the most efficient means of checking the decomposition which so speedily commences. Would it be desirable to return to the old practice of keeping cows in London and other cities for supplying the inhabitants, as formerly, with milk of very inferior quality? Or is the use of milk in which the process of souring and decomposition has commenced to be permitted without a question as to its effects on the health of those, especially children, for whom it forms so important an article of food, while at the same time the effect of a trace of an efficient, and as far as is known, perfectly harmless preservative, is subjected to a severe, if not an unjust criticism? So also fresh unsalted butter, in a perfectly sound and palatable condition, is, through the use of boric acid preservative, brought within the reach of a large proportion of our population, who would otherwise be deprived of its beneficial use, for of all obnoxious articles of food, none surely surpasses rancid butter, with its free butyric and other allied acids, the injurious effects of which cannot be doubted. No attempt has been made by the circulators of the vague adverse statements referred to, to institute experiments for the purpose of ascertaining from direct observation, whether now or at any time during the several years that preparations of boric acid have been extensively used for the preservation of milk and butter, there have been any instances in which injury to health has resulted from even their habitual employment."

A favourite argument with those who oppose the use of borax preservatives is that, granted the amount required to preserve food is small the constant use of it is sure to cause bad effects in the system. This is an assertion which can be substantiated by actual experiment if there is anything in it, but all the recorded results of experiments are diametrically opposed to such an assumption. Dr Oscar Liebreich of Berlin, in a masterly treatise on the effects of borax and boracic acid on the human system, disposes of the points by giving the results of actual experiment. He found that—

"Even large doses of boric acid taken continuously for some length of time have not proved injurious to health. This conclusion is justified from the observations made in internal application, and some experiments on human cases. Polli relates: eight persons were able to take each 2 grammes of boric acid dissolved in milk daily for 45 days, and 4 grammes for 23 days, without showing the slightest abnormal symptom. The urine passed during the period remained acid and without any sign of decomposition for a considerable time.

Boric acid has been taken therapeutically for weeks and months, in doses up to 15 decigrammes, without producing any untoward symptoms. And borax, even in large doses, and taken during a prolonged period, has been borne without inconvenience. This is authoritatively borne out by some self-observations of Virchow, who for three months kept to an alkaline diet with large doses of borax, and found that, far from doing him harm, the treatment had a curative effect. If overdoses of borax—*not* boric acid—were to be given for an undue length of time, the result, as in the case of other alkalis, would necessarily be a scorbutic condition. There has, however, been no opportunity to observe such an effect."

Experiments were conducted with animals and they proved beyond doubt, that instead of having any deleterious effect, the contrary was the case, and so far as the argument of accumulating in the system was concerned, Dr Liebreich's conclusions were also of an opposite nature. He says that—

"Animal experiments demonstrate further that borax is *easily excreted* from the system, and that *no accumulation takes place*. This is clearly shown by the following experiments:—Two dogs, one weighing 8 kilos. 640 grammes, and the other 8 kilos., were fed for five consecutive days; dog No. 1 with borax, and dog No. 2 with boric acid, the dose being 150 centigrammes daily, dissolved in 60 cubic centigrammes water, and mixed with the ordinary food. Thirty hours were allowed to elapse after the last dose, the animals then killed, and their brain, spinal cord, blood, liver, and bone marrow chemically examined for boric acid without the slightest trace being found. And in rabbits, which had been fed for five consecutive days with daily doses of 100 centigrammes, and killed five days after the last dose, no remains of boric acid could be found."

Working far apart and on independent lines, Dr Chittenden, professor of physiological chemistry in Yale University, arrived at practically similar conclusions. He sums up his experiments thus—

"Both borax and boric acid are without influence upon the putrefactive processes of the intestine, apparently because of their rapid absorption from the intestinal tract and quick elimination through the urine. Practically, elimination is complete twenty-four to thirty-six hours after the last dose of borax or boric acid has been given. Obviously, this rapid elimination precludes the possibility of any marked cumulative action from the daily ingestion of moderate quantities."

Investigation carried out on practical lines has resulted in the fact being established, that borax and boracic acid instead of being injurious to the human system are really wholesome substances. If harm resulted from their use, the immense quantities which have already been swallowed would have aroused the attention of medical men. Leading medical men, however, have taken up the opposite view.

The *Lancet*, a few years ago, appointed a special sanitary commission on the use of antiseptics in food, and the following extracts are taken from their report:—

The late Sir Benjamin Ward Richardson replies — "I have read your letter carefully respecting the use of antiseptics in foods, and my opinion is that they are not only necessary at this moment, but that when used in proper form and quantity they are perfectly correct—that is, they cause no injury whatever to the consumer."

Sir William Roberts replies—"I take it that there is really no reliable information available on the subjects embraced in your circular, and I doubt very much whether the opinions of the medical practitioners on the points in question are of any value, and they might be very misleading."

Dr Bradbury, of Cambridge, replies—"No case has come under my notice in which I thought small quantities of antiseptics used in the preservation of foods, beverages, etc., have been prejudicial to health, and I am disposed to think that the presence of small quantities of salicylic, boric or benzoic acids in sufficient quantities to preserve them is not injurious to health."

The summary of the *Lancet* was as follows—"It seems to us that in some cases preservatives may have their legitimate use, as unquestionably there would be much good and valuable food lost and wasted, especially in the hot summer months, if there were no easy and convenient means of preserving it against change."

In a case tried at Pontypridd for using boracic acid for preserving hams, Professor Haycock (professor of physiology at Cardiff University), said—"The recent experiments which he had made showed that boracic acid was not injurious to health as far as digestion was concerned."

Dr Bond (senior surgeon to the Westminister Hospital), said—"he had for the last fifteen years used boracic acid largely both in surgical dressings and for internal purposes. In one extreme case he had kept a child alive in a solution of boracic acid for six months. He had a patient who had been taking 30 grains a day for months, and that gentleman said that he never felt better. He thought that hams cured with boracic acid would be much more easily digested than strong salty hams.

Dr Bell, of Glasgow, said—"that for the last seventeen years he had been in the habit of using boracic acid in milk, and also in ham and bacon. He had not been able to find out that it had the slightest ill effect on the members of his family. They had been a remarkably healthy family. He had used a very large quantity of boracic acid on a woman to remove a tumour. It saved the woman's life."

Professor Attfield, the editor of the *British Pharmacopœia*, for the General Medical Council, said—"he had been familiar with boracic acid in its uses and properties for more than forty years, and it was most certainly not injurious to health as a food preservative. He knew that by personal experience, for as a dyspeptic patient he had taken it for many months. It did not retard the digestion in the slightest degree."

Dr Buist, of Cardiff said—"he had used boracic acid for some years. He had prescribed it in medical and surgical cases, and he had never seen any ill effects after it; he had seen good effects. He had used it in the case of infantile diarrhœa, so that even to children it did good."

The following questions designed to get at the actual facts as to preservatives were addressed by a firm interested in the trade to prominent medical practitioners:—

> "In your practice have you met with or do you know of any injury arising from the use of animal food substances which have been prepared and preserved with borax or boracic acid?"
>
> "Also, have you met with or heard of any injury from the outward application, or from the inward administration of borax or boracic acid?"

And among the many replies received, the following give a fair index of the universal testimony to the harmlessness of borax preservatives:—

Dr Oliver Pemberton, of Birmingham, replied that—"he had never witnessed any injurious effects, nor had he heard or read of any having occurred, or been recorded by others; he had no hesitation in expressing an opinion that, used in regulated proportions for the preservation of food, the preparations of borax and boracic acid are not only absolutely safe, but of the greatest value."

Dr Willington, Handsworth—"I consider it is the finest antiseptic known, very valuable in cases of gastric irritation and dysentery, and I have never met with an instance or heard of one in which it was injurious, nor do I know of any authenticated case of injury from its employment.

I have used borax in surgical cases for many years and found it most valuable. It does not cause any pain when applied, and it destroys completely the bad smell from the most fœtid ulcers."

Dr Iliffe, Kendal—"Knowing that borax increases the secretions of the gastric juice, I was led to the administration of small doses of it before a meal with the happiest results; several chronic cases were much benefited and functional acute ones were quickly cured. It must, however, be administered with method, *i.e.*, not too soon after food, but rather half-an-hour before.

But its valuable properties do not end in medicinal compounds, perhaps it is even more useful as an antiseptic preservative. By its aid you may preserve milk, meat, fish, and other food, and I have found a solution of one in forty the best strength to use.

As a lotion in purulent opthalmia it is unsurpassed, and as a surgical dressing it is most satisfactory."

Dr Wynter, Kenilworth—"I can reply to your questions at once by stating that I have never met with any injury from the outward application of borax or boracic acid—or from the internal administration thereof.

In my opinion they are unique antiseptics, and safe under all circumstances."

Dr Bennet May, Birmingham—"I have never seen any ill effects from its use, or any reason to regard it as injurious to health.

I think it may be safely used as a food preservative in proper quantity, and I believe it has a legitimate position for this purpose."

Dr Hart, Harbome—"In some cases of gastric disorder, milk foods produce flatulence. I have found that small doses of borax or boracic acid added to the milk will diminish the flatulence; and I can therefore see no reason why borax or boracic acid should not be used as preserving agents, provided the quantity is made known to the purchaser. Externally I find its use followed by the best results."

Dr Lawson, West Bromwich—"In my experience, they are not injurious as preservatives for food stuffs, such as butter, milk, etc. I have not during my rather extensive practice, extending over a period of twenty-three years, at home and abroad, ever heard of, or met with, any injurious effect caused by food preserved by these boron compounds.

No doubt a great quantity of valuable food would be lost were it not for the use of these innocuous and safe antiseptics."

Dr Steel, Kidsgrove—"I have never observed any injurious effects produced by borax or boracic acid, either *per se* or as a food preservative. I have not heard of any patient being admitted to the infirmary suffering from the effects of boracic acid."

Dr Ray, Manchester—"I do not know of any patient of this infirmary who has suffered from any ill effects produced by borax and boracic acid, nor do I know of any injurious effects from the use of borax or boracic acid as a food preservative."

These quotations and medical testimony are only a small number of the whole, but they are sufficient to prove that food preservatives compounded from boracic acid and borax are not only harmless in use, but are actually wholesome substances so far as the human system is concerned.

Foreign Live Stock.—see Live Stock in Foreign Countries.

Foreign Moneys and their English Equivalents—

Country.	Chief Coin.	Nominal Value. s.	d.
America	Dollar	4	2
Argentine Republic	Peso	4	0
Austria	Florin	1	8
Belgium	Franc	0	9½
Brazil	Milreis	2	3
Canada	Dollar	4	2
China	Tael	6	6
Cuba	Dollar	4	2
Denmark	Kroner	1	1¼
Egypt	Piastre	0	2½
Finland	Markka	0	9½
France	Franc (100 centimes)	0	9½
Germany	Reichsmark (100 pfgs)	1	0
Greece	Drachma	0	9½
Holland	Florin	1	8
India	Rupee (nearly)	1	9
Italy	Lira	0	9½
Japan	Ichibu	1	4½
Java	Florin	1	8
Mexico, Chili	Peso (about)	4	2
Norway	Krone	1	1¼
Persia	Tomaun	9	5
Peru and Venezuela	Dollar	4	0
Portugal	Milreis (about)	4	7
Russia	Rouble (paper)	2	2
Spain	Escuda	2	0
Sweden	Krona	1	1¼
Switzerland	Franc	0	9½
Turkey	Piastre (nearly)	0	2¼
Uruguay	Peso	4	2

Frames for Lard.—see Lard Blocking Frames.

Frankfort Sausage.—Take a middle-sized ham and clean out all the sinews, etc., and chop it, but not very fine. Ham should not be so finely chopped as other meats. To 22 lbs. of this sausage meat, add 7 ozs. of salt, 1 oz. ground pepper, four grated nutmegs, and enough ground cloves to cover the point of a knife. Mix well, and work in a little water until it is a stiff paste. Fill into narrow pig skins, allow the sausages to dry for a day, then smoke *slowly* until they are yellow.

Frankfort Sausage (Smoked).—Take 25 lbs. of pork, from very young, light, and very much fattened pigs, which contains a great quantity of jelly. The meat may be taken from the hind or the fore-legs, the neck, or the breast. It should, before weighing, be freed from all bones and outside skin, and then hung up in a clean, cool place to cool and dry. The proportion should be about two parts lean to one part fat. Now mince the pork into pieces about the size of a hazel-nut, add ¾ lb. salt, ¾ oz. white pepper, ½ oz. nutmeg, and mince the whole steadily, turning it often and continually cleaning the knives, adding a quart of water gradually while mincing. If it is very stiff, a little more than the quart may be added.

Now mince the pork until the pieces are the size of barley grains, then divide it all into masses about the size required for each sausage, and throw these from hand to hand two or three times without kneading at all. Then prepare the filling machine, taking care always to fill the cylinder very full of meat, so as to leave no room for air.

Put the meat into narrow pig-skins (which have been first well washed and dried), filling them very full, then turn each up and tie the two ends together in pairs, weighing from four or five to every pound. Hang the sausages on clean smoking sticks and let them dry for five or six hours, then hang them pretty high up in the smoking-room across the width of the room (see "Smoke Stove.") The smoking should be accomplished with fresh air coming in. Smoke with fresh oak and beech sawdust, with an equal temperature of 72° to 78° Fahr., and let the sausages hang until they have a red-yellow colour, which will take from about eight to ten hours. If they are smoked more rapidly, they lose colour more quickly and don't keep so long.

Before being eaten these sausages should be put in boiling water and boiled eight minutes.

Frankfort Meat Sausage.—The Frankfort Meat Sausage (Frankfurter Heischwurst) is made purely of pork. The hind-legs, fore-legs and belly of the animal may be used.

Take the finest, firmest quality of pork to be had from light, young pigs. If it is impossible to have it all pork, one-third beef may be used, but all pork is better. Take 20 lbs., then, of good pork, if possible, and mince the size of chestnuts, add $\frac{3}{4}$ lb. salt, then add a little water, and mince the size of hazel-nuts. Add now 1 oz. white pepper, $\frac{1}{4}$ oz. nutmeg, 3 sticks of garlic, 2 sticks of eschalots (finely grated), then mince until the meat is as fine as grains of rice, and throw the meat about from right to left on the block several times, but be careful not to knead with the hands. Now put the meat into narrow salted bullock runners, 2 to 3 inches long, fill them very tightly, tie them up, let the sausages lie from eight to ten hours to dry, and smoke them in a temperature of 64° to 68° Fahr., letting them hang until they are of a yellowish-red colour, and then boil from twenty-five to thirty minutes. They can be allowed to hang in the smoke-room until they are required, and then boiled, or they may be boiled as soon as they are ready: they may be eaten either warm or cold.

Frankfort Home-made Liver Sausage.—The *Frankfort* Home-made Liver Sausage differs from other liver sausages, in as much as all the materials are raw, except the finely minced bacon.

Prepare after the following fashion:—

Take 10 lbs. raw pig's liver,
2 grated onions,
7 lbs. raw common pigs' fat.

First mince the liver fine, add the raw fat and mince fine together, next add 3 lbs. of boiled fat bacon cut into small dice, then add 12 oz. fine salt, 1 oz. fine white pepper, $\frac{1}{3}$ oz. thyme, $\frac{1}{3}$ oz. ground cloves. Mix these ingredients well together first, then work them well into the mixture, then fill all into middle-sized (in width) ox runners, 18 inches long, not too tight, indeed rather loosely. Then put the sausages into boiling water, and boil from forty to forty-five minutes according to their thickness. Prick them with a fork occasionally while they boil. It must not be expected that home-made liver sausage should be white, instead it should be of a grayish shade, but it has a piquant taste: smoked, it tastes excellent.

Frankfort Liver Sausage (Common).—Take an ox liver; remove the outermost skin and the large veins; a pig's liver cleaned in the same way; pigs' lungs or ox lungs with all the little air-canals cleaned out, particularly anything that has blood about it. Take equal parts of each and mince both finely together, then add from six to eight onions and some different fat leavings.

For instance, to make about 40 lbs. of liver sausage meat, take

12 lbs. raw liver,
12 ,, raw lungs,
10 ,, different "odd pieces" (fat),
6 ,, bacon cut into dice.

Spices—

$1\frac{1}{4}$ lbs. salt,	$\frac{3}{4}$ oz marjoram,
2 ozs. pepper,	1 oz. thyme.

Mince the meat, and add the spices and mix all well together, in winter adding as well, a few spoonfuls of strong stock, if procurable. Put into skins and let them boil until, when they are pricked with a skewer, the juice comes out clear. Wash them immediately on coming out of the pot with fresh water, but before taking the sausages out of the pot all the fat should be skimmed off the top, so that it may neither hang about the sausages nor be lost altogether.

If a large supply of liver sausage is required on short notice, oxen and calves' plucks and calves' heads may be put in. These should be boiled some days before using, if possible, as they can then be chopped up with the other ingredients early in the morning, the skins filled, and the sausages offered for sale the same day.

Fine Frankfort Liver Sausage.—This is prepared in many ways. The following is one of the best:—

Take 7 lbs. raw pigs' liver, free from blood; also 5 lbs. of boiled veal (don't boil until very tender) from the breast, the neck, or the cheeks. For a change *calves'* liver may be taken, provided that it is particularly clean and white.

Mince the liver quite alone till very fine; add from twelve to fifteen fried eschalots or two fried onions. Now mince the veal fine along with 4 lbs. of boiled fat, collected from the inner organs, etc., of pigs. After all is finely minced, add 4 lbs. of fresh bacon cut into dice. To this quantity of sausage-meat—20 lbs.—the following is the amount of spice required:—12 ozs. fine salt, 1 oz. white pepper, $\frac{1}{3}$ oz. fine white ginger, $\frac{1}{3}$ oz. ground marjoram, $\frac{1}{3}$ oz. ground mace, $\frac{1}{3}$ oz. ground thyme.

Mix these spices well together first, work them diligently into the meat, and then taste it; it should be fine. Put them into wide white pigs' skins, and don't fill too full. Then put them in boiling water, and boil from half-an-hour to three-quarters of an hour, according to their thickness, trying them occasionally. They will be ready to come out when the juice comes out quite clear. Don't prick them too much so as to lose all the juice. After they are boiled, take them out of the pot, throw them into cold water, where they must remain until perfectly cold. This keeps in the juice, makes the sausage firm and the skin of a white colour.

Frankfort Blood Sausage.—For blood sausage, bacon only half-boiled is required. Cut it into pieces the size of peas, then put it into a large sieve and pour boiling water over it to get rid of all grease, then let it dry. By this means the sausage, when made, can be prepared much more quickly.

Take, to make 40 lbs. of sausage meat, one-third of that of tenderly boiled and finely chopped rind of pork, and two-thirds finely minced bacon. For spices take 20 ozs. salt, 3 ozs. white pepper, 1¼ oz. allspice, 1 oz. fine marjoram, 1 oz. grated nutmeg, 12 eschalots, finely grated.

Mix the spices well together, then add to the meat; again mix well. Afterwards add about 2½ to 3 quarts, according to taste, of fresh pig's blood, and work all well together. It is best to mix it in a tub. Now have ready an empty pig's stomach, and fill it three-quarters full. As soon as it is filled and tied fast, throw it into a kettle of boiling water. Do the same with the other, and stir them round lightly. Be careful to keep a special pot for cooking this sausage. Let them boil until, when tried with a skewer, the juice which runs out is quite clear. Now wash them, and then lay them on a table to dry and cool, turning them often that they may cool quicker.

It is of great importance to have fresh blood. It may be pigs', calves', sheep's, or ox blood, but not from oxen unless they have been killed in such a fashion so that the blood has not got mixed with any of the foul stuff from the stomach of the animal. If the blood stands for a day, a scum will gather on the top of it which must be carefully skimmed off, and then it should be poured through a sieve and some salt added to improve the colour.

Frankfort Compressed Tongue—To make compressed tongue, first take either a fore-leg or hind-leg of pork. Chop it up coarsely with salt, saltpetre, and Indian cane sugar. The quantities are—

20 lbs. meat *good quality* (not too fat),
12 ozs salt, 1 oz. Indian cane sugar,
½ ,, finest saltpetre, 2 sticks eschalot.

Chop this coarsely and then mix well; put into some covered place for 24 hours when it will be a lovely red colour. Now mince fine, adding during the process the following spices:—1¼ oz. ground white pepper, ⅓ oz. mace, ⅓ oz. ginger, ⅙ oz. cardamom, finely ground.

Now cut a fine red tongue into large dice, say about 3 lbs., and add two handfuls of Pistachio nuts, mixing all gently and carefully, not to press the tongue-dice out of shape. Then fill into clean, salted, red bullocks' runners, 12 inches long, and tie them up tight. Boil from one and a half to one and three quarter hours, trying them as usual to see if they are ready.

After they cool, they can be smoked to taste with sawdust with which has been mixed a few handfuls of juniper berries. This tastes well and makes them looks well.

Frankfort Yellow Sausage.—

7 lbs. pork (from the breast and liver),
3 ,, brains.

Chop the raw pork; take away blood and skin from the brains of pigs, calves, and oxen. Chop it up and add to the pork, and mince both fine together. Add ⅓ oz. fine salt, ⅔ oz. fieshly ground white pepper, ⅙ oz. nutmeg grated.

When all is finely minced and mixed together, put it into fine, white, fresh pig-skins, 18 inches long, not filling them too full, as the meat swells during boiling. Put the sausages in boiling water and boil from forty-five to sixty minutes, trying them in the usual manner. The sausages should be taken hot out of the pot, freed from grease, and then at once painted yellow equally all over.

The following is the recipé for the yellow colouring:—

Mix a tea-spoonful of saffron with two table-spoonfuls of rum, then add two table-spoonfuls of hot water and the beaten yolk of an egg. In summer it is better not to use the egg. If properly painted, this sausage should be a great ornament to the shop window, and when it is cut, it should present a very white appearance inside.

Frankfort or Vienna Sausage, Weinerwurst.—No 1.—To 18 lbs. of veal, add 72 lbs. of lean and 10 lbs. of fat pork. Chop finely and mix well, adding 32 ozs. of salt, 10 to 12 ozs. ground white pepper (if black, one-third more), 1½ pints of water. Stuff and tie into sausages weighing 4 ozs. each; smoke 48 hours. Weinerwurst may be made from salted or pickled meats the same as from fresh. Garlic may be added if liked. Potato flour causes the meat to adhere together and allows a sufficient quantity of water to be added to make dry meats more moist and palatable.

No 2.—To 5 lbs. of lean pork, add 2½ lbs. of beef and 1 lb. of fat pork. Chop finely and add ½ lb. of veal to every 100 lbs. meat. Add from ¾ to 1 lb. of seasoning, and 2 to 5 lbs. of best German potato flour, which will allow the addition of considerable water. Mix well and stuff into best English sheep casings. Divide the sausages into equal parts and hang in an airy place for half an hour to dry. Smoke half an hour over a light fire, and finally an additional hour over a strong hot fire. Boil five minutes before being eaten. Weiner sausages will not keep long without becoming dry and unpalatable.

Frankfort Sausage.—Use 60 lbs. of lean, 25 lbs. side meat, 15 lbs. fat pork, chopped not very fine; add 14 ozs. salt, 7 ozs. ground white pepper. Stuff in hog casings, smoke for 48 hours. For table use, cook 5 minutes in boiling water. Do not keep too long, as they will be too dry to cook; but can be eaten cold.

Freibank.—This is the name given to a shop in German abattoirs, in which suspected meat which has been cooked by the abattoir authorities, is sold. The meat of suspected or partially diseased animals is in many cases unwholesome only if improperly cooked, hence the German Government have decreed that such meat will be cooked under the supervision of the authorities of their abattoirs, and sold at a duly authorised shop (termed the Freibank) within the precincts of the abattoirs. The Freibank is a most useful and sensible institution.

French Blocks.—see Hornbeam Blocks.

French Blood Sausages.—see Blood Sausages.

Fruit Cleaner.—see Currant Cleaner.

Frills for Hams.—see Ham Frills.

GALANTINE of Boar's Head.—Take a good sized pig's head and scald until the skin can easily be removed. Take out the bones and meat, sawing off the bones near the snout so as not to interfere with its shape. Lay the skin and meat in pickle for five days. At the same time lay in pickle some tongues. At the end of that time remove all from the pickle, and boil until the meat falls from the bones. Now, prepare a mixture of veal, pork, and pig's tongues and two eggs, cutting all up into squares, and seasoning the

whole with ordinary No. 1 pork sausage seasoning, to which has been added some whole peppercorns. Sew up the skin of the neck, leaving only a small aperture for the insertion of the sausage filler funnel. Tie up the mouth, and stuff the nostrils with pieces of fat, and proceed to fill in the mixture until the whole skin is distended tight. Now roll the whole in a cloth, allowing the ears to stick up, and boil for about one and-a-half hours, never permitting the ears to get beneath the boiling water. Remove when thus boiled, and paint the whole skin over with a weak solution of saffron so as to produce a yellow colour. When sufficiently cool remove the cloth and insert in the mouth a small lemon and glass eyes in the eye-holes. Garnish with such decorations as may be at hand, such as artificial flowers or crayfish, etc. The head is then ready for serving.

Galantine.—Take the bones and sinews out of a leg of veal, and weigh 11 lbs. of it; also 5 ozs. of anchovies, removing the bones. Add the anchovies to the veal, and chop up very fine together. Mix with it 4 ozs. of salt, 1 oz. of ground pepper, and 2 grated nutmegs, and make the whole into a paste with water. Then take a handful of pistachio nuts, $\frac{1}{8}$ of a glass of French truffles cut into dice, and about a lb. of raw bacon, and the same quantity of salted and cooked tongue, both also cut into dice. Work all these lightly through the paste, and then make it up into little rolls in the form of thick sausage, roll them in cloths, and tie up fast with string. Boil for an hour; let them lie in cold water for another hour, and then hang up to drip. When they are perfectly cold take off the cloths.

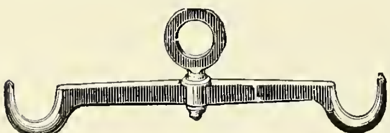


Fig. I.—Swivel Iron Gambrel.

Gambals or Gambrels.—These may be made of iron or wood, but are generally of the former and galvanised to prevent rusting. In some cases they are made with a swivel eye such as in Fig. I. The illustrations afford sufficient explanation of their use, which is to hang carcases by the sinews of the hind legs. They are made in many different sizes, beginning with about 8 inches in length; the smaller sizes being used for lambs.

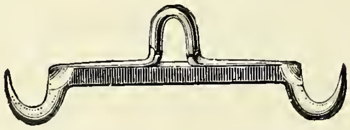


Fig. II.—Ordinary Iron Gambrel.

Game Pie.—Cut up the game into joints or pieces, and put into a pie dish, with some fat ham or streaky bacon, season rather highly, cover with puff paste, and put in oven to bake, when rather more than half done, raise the crust and pour in a table spoonful of melted butter and the juice of a lemon, then finish baking.

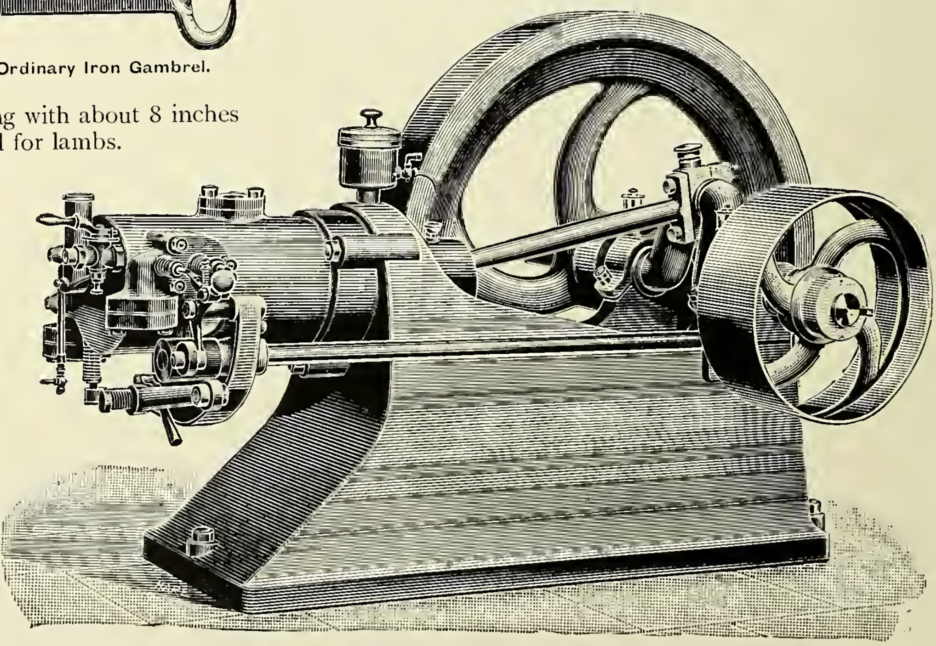
Garlic is a wholesome aromatic herb with bulbous roots, which split up into lesser bulbs. It is much cultivated in France and Germany for culinary purposes, and is beginning to be more used in England for a similar purpose. In sausage recipés it is very often an ingredient. It also figures in the recipés of French cooks. To mix it with food of any kind it has to be bruised with a knife into a fine mass, or it can be cut into slices and infused for an hour in wine. The wine is strained off and used for flavouring.

Gas Engines.—The gas engine, now so extensively used as a prime motor, both on the largest and the smallest scale, derives its power as is well known from the expansive force developed by the explosive combination of gas with the oxygen of the air. Coal gas is most commonly used for this purpose, but a special gas developed from anthracite or coke in an apparatus called a "gas producer" is frequently used for the larger sizes of gas engines. Producer gas is weaker than ordinary gas, and to obtain the same horse-power the engine using producer gas must be about 20 per cent. larger than that driven by ordinary gas. What is called the "otto cycle," is that adopted by all the best makers, especially since the otto patents expired. On the whole the modern gas engine is the cheapest motor to work in existence. It is easily started and stopped and takes up very little room compared with a boiler and steam engine. The makers of gas engines are legion and the best advice to the intending purchaser is to deal with a firm of good name, and obtain a guarantee of durability and gas consumption.

Gas Heated Coppers or Pans.—see Boiling Pans.

Gas Ovens.—see Baking Ovens.

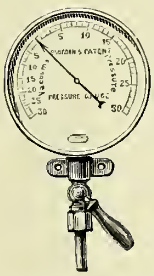
Gas Producer.—The great development in the use of gas engines raised the question of a cheaper fuel than ordinary coal gas, and a series of experiments has resulted in the invention of the modern gas producer, in which a gas suitable for working gas engines and also for a variety of other purposes, such as brazing, soldering, baking, cooking, etc., can be made at a cost of from 2d. to 3d. per 1000 cubic feet. This is a very cheap price, even taking into account the fact that the gas is only about $\frac{1}{4}$th the strength of coal gas, and where large gas engines are employed, it



Douglas "Otto Gas Engine

pays very well to put down a producer plant. The process of manufacture is very simple. A current of superheated steam mixed with air is passed through a mass of red hot anthracite or coke, and in this way the gas is produced. For use in gas engines it is cooled, washed, and scrubbed, and passed into a gas holder. The production of gas can be stopped and resumed again with the greatest facility, and the loss of fuel when the plant is " standing by " is very small. The space occupied is about the same, relatively, as that of a boiler to a steam engine.

Gauges.—The gauges used in the food trades are mostly those for measuring the pressure in lbs. per square inch on steam boilers, bone digestors, ham cookers, refrigerating machines, etc. The system commonly adopted is known as the "Bourdon" gauge, which consists of an elliptical metal tube bent into a ring which seeks to uncoil itself when subject to internal pressure; and in proportion to that pressure one end of the elliptical tube is attached to the pipe leading from the boiler or other machine. The other end is closed and connected by a short link to a quadrant gearing with a small pinion attached to an index pointer, which indicates, on a graduated index, the pressure of steam, etc.

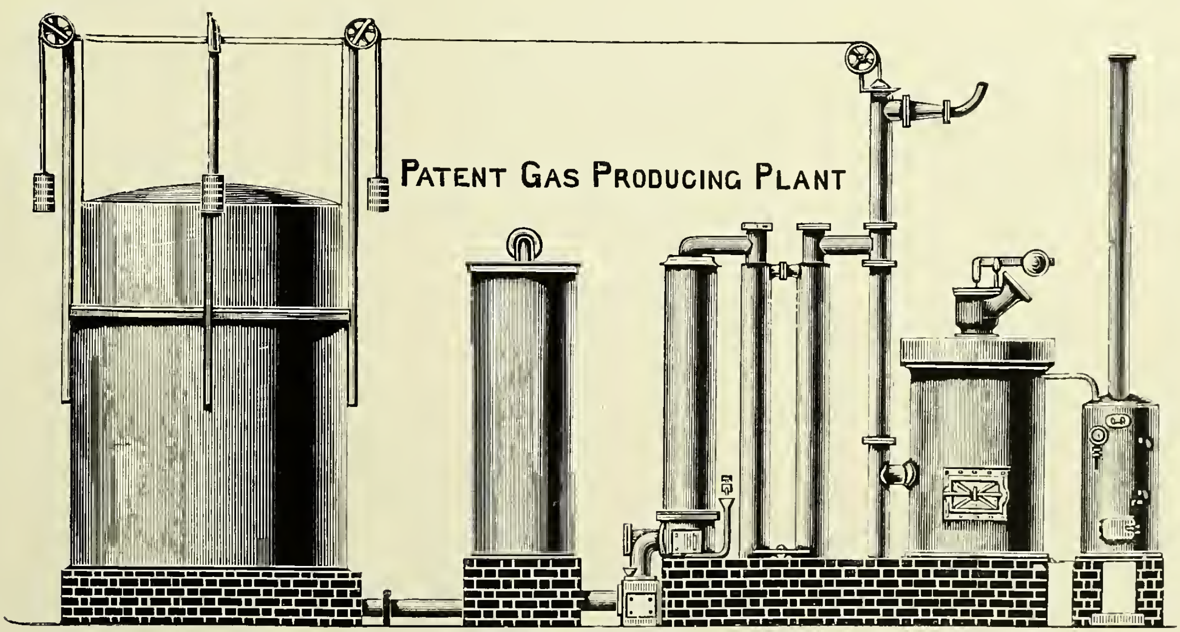


Bourdon Gauge.

The inverted syphon pipe placed under the gauge contains water which prevents the heat of the steam acting injuriously on the working parts of the guage.

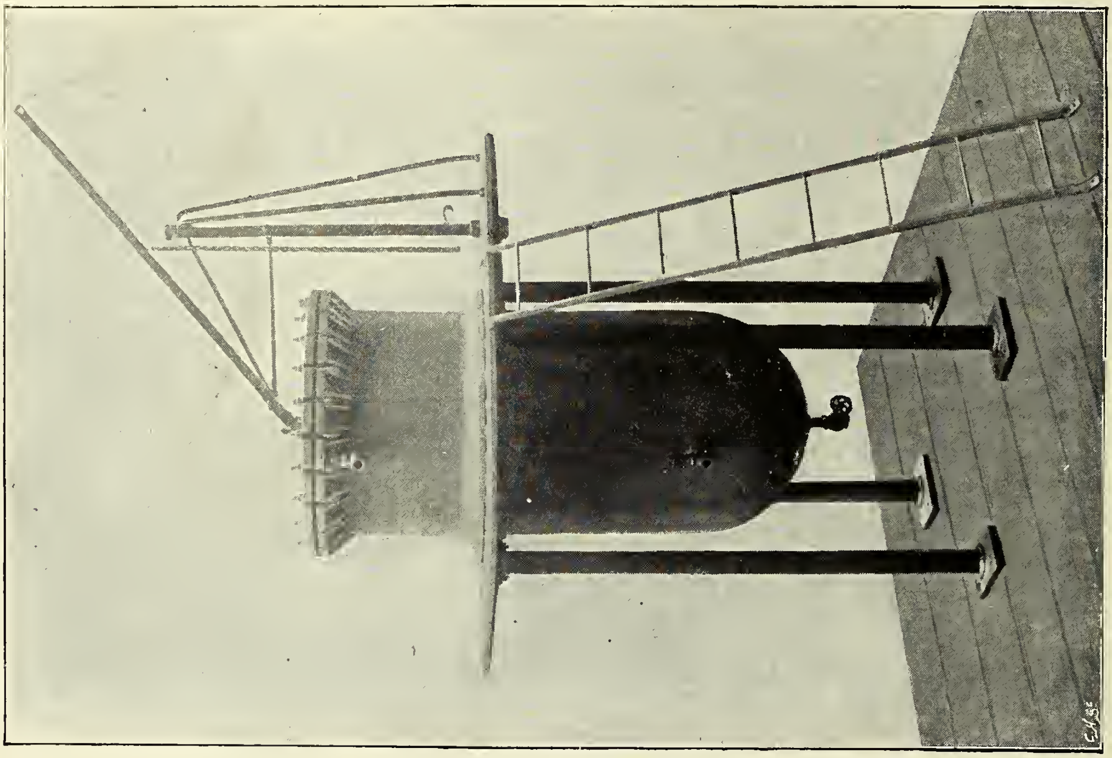
Steam gauges indicate the pressure of steam above the atmosphere.

Gelatine.—Gelatine and glue are derived from a number of animal substances, such as skins, tendons, bones, intestines, horn piths, fish bones, scales, swimming bladders, etc. When any of the above are, after suitable preparation, boiled with water, a solution results which sets into a jelly on cooling, and on drying at a low temperature the jelly gradually turns into a dry hard glassy substance. If this substance is prepared from fresh high class materials it is called gelatine; if from crude materials it forms glue. Gelatine is largely used in the food trades for making jellies for tinned or potted goods, soups, thickening brawn, etc. The making of gelatine from bones is of considerable interest as it supplies a profitable means of utilising a practically waste material. The bones are placed in a Douglas digestor for convenience, a strong cage which lifts out and in, being used. Steam is turned on at a pressure of from 30 to 40 lbs., and maintained at this figure for about an hour, to remove the fat from the bones, the outlet cock is kept dribbling all the time to allow the fat to run off as soon as formed, and thus prevent overheating which is very injurious. At the end of an hour the receiver is changed and the pressure of steam raised to 40 lbs., or over if possible, when gelatine begins to be formed immediately. This pressure is kept up for two or three hours, the run-off cock being allowed to dribble all the time. Towards the end of the process some water may be run through the bones by means of a perforated ring to wash out the last of the gelatine. The resulting jelly may either be used as it is in brawn or for potting, etc., or it may be clarified with blood or egg albumen, which is to be added to the solution when it is fairly cool, but of course above the setting point. The albumen and gelatine solution are thoroughly mixed together by agitation, and the solution is then raised to the boiling point, when the albumen coagulates and imprisons the impurities and the jelly may be filtered clear.

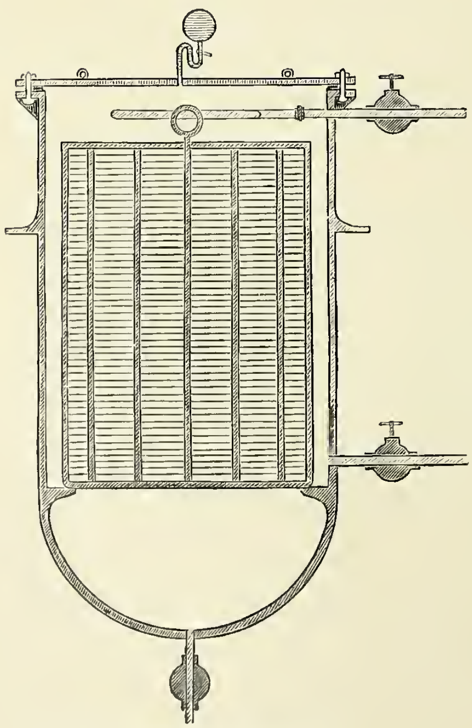


Gas Producing Plant.

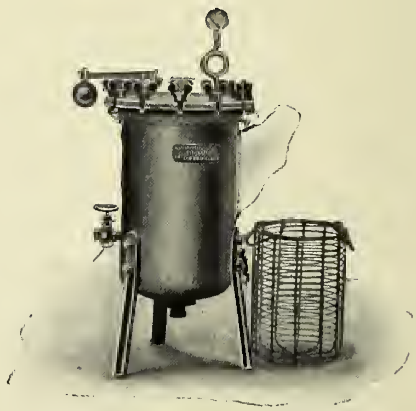
German or Luncheon Sausage—*sometimes called also Breakfast Sausage or Bologna Sausage.*—The sausage made under any of the names given is a purely British product, and does not exist in any other countries, except America. In Germany or Italy (Bologna), they do not know it.



Douglas Bone Digestor.



Section of Douglas Bone Digestor showing cage and water ring.



Small Bone Digestor for shop use, which may, if necessary, be worked with gas.

Boiling and Cooking German and other Sausages.

The best recipé, and one from which the greatest bulk of this sausage is made in the United Kingdom, is as follows:—

18 lbs. beef.
12 ,, salt trimmings.
12 ,, back fat.
14 ,, farinaceous material.
10 ,, water.
8 ozs. dry antiseptic.

The *back fat* should be cut separately into squares about half-an-inch in size and added to the mixture in the machine when it is nearly finished, so that little squares of fat will appear in the sausage.

The *farinaceous material* should be of the very best flour, corn flour, and farina.

The *seasoning* should be made up as follows:—

$5\frac{1}{2}$ ozs. white pepper.
3 ,, saltpetre.
1 ,, mace.
1 ,, nutmeg.
2 ,, ginger.
$\frac{1}{2}$,, cinnamon.
1 ,, sugar.

This quantity to be used for each block.

The *colour* may be added to the shade required. But it must be quite certain that the colour is purely vegetable and harmless. The colour of the mixture should be nicely meaty in appearance, and uniformity should be aimed at, so that all the produce of this sausage should be alike in appearance. It is best to add the colour in solution, and the quantity must be left to the judgment of the operator.

The mixture is filled into clean and sweet ox-bungs by means of the ordinary sausage filler, fitted with a wide nozzle for the purpose. They are tied so as to allow of a little expansion of the materials in cooking. Tie strings to both ends of the sausage so as to form a loop by which to lift them. Now plunge them into water heated to 180° Fahr., and boil at that temperature for an hour. Drop the temperature then to 170° Fahr., and keep it at that for two hours. The sausages are then cooked and may be taken out and placed in the smoke stove until they become a brownish tinge. Some makers hang *German sausages* in cold smoke hole over night and smoke six hours next day. Colour is said to be perfect and skin hard. They are then taken out, cooled, and after rubbing with a cloth containing some olive oil, they can be sent out.

The *colour* may be improved by dipping the sausages in brown dye before smoking. The *smoke flavour* may also be intensified by adding some *smoke powder* to the mixture when being chopped. This addition is preferred by many.

Recently much attention has been given to the fact that a green mould appears on these sausages after keeping them for a few days. This, however, can be prevented by the use of an *antiseptic varnish.*

The *cooking* is very often done in a Douglas's ham cooker. By this method it is a very cleanly operation. The sausages should be laid on the racks and when the door has been put on, turn on the steam until the temperature is steady at 180° Fahr., at which temperature keep it for an hour. After one hour reduce the temperature to 170° Fahr., and keep it at that for two hours. The sausages will then be cooked. The lowering of the temperature prevents *bursting* of the skins, and waste in weight.

There are other methods of making these sausages and the following are those taken from *Douglas's Receipt Book:—*

German Sausage—*sometimes called Bologna or Breakfast Sausage.*—The ordinary German sausage, as made in this country, is maunfactured in a variety of ways, according to the locality, and as meat is easy to get or not. It is, therefore, difficult to lay down any general rule in the matter of the meats to be chosen. Where hams and salt pork or salt meat are the principal items to be used, it is necessary that the maker should make allowance for the salt present. In all cases some judgment is necessary in substituting anything else for beef, veal, or pork. These are the only items in the recipé which call for any variation, and that variation will depend on the meats which are available. If the sausage maker chooses to follow this recipé entirely he will produce a splendid sausage, but must not expect if he departs from it to any great extent to meet with much success.

Recipé for German Sausages.

16 lbs. beef.
8 ,, veal or pork.
8 ,, back fat.
5 ,, flour.
5 ,, sausage meal.
2 ozs dry antiseptic (food preservative).

11 ozs. salt.
3 ,, saltpetre.
4 ,, white pepper.
1 ,, ground coriander seed.
1 ,, ground nutmegs.
½ ,, ground ginger.
1 ,, cane sugar dissolved in water.
3 ,, smoke powder.
¼ a tea-spoonful Armenian bole (No. 1).

Where smaller quantities are desired, simply reduce the recipé by dividing each of the quantities of ingredients by same figure, so as to maintain always the same proportion.

Method of Preparation.—Before placing meats to be used in machine, cut them all, excluding back fat, into pieces about two inches square, and mix together by hand, having previously dipped the hands in cold water. When mixed in this way put into machine and proceed to chop. Scald the *flour* previous to use and put it in next, then add the *sausage meal*, *dry*, very slowly, running it through the fingers. This will enable it to be thoroughly incorporated with the mixture, and allow it to suck up the fat. Add next *all* the other ingredients. The mixture, except where very wet frozen meat is used, will become very dry, and it is then necessary to add some *water* until the proper consistency is reached.

When the mixture is thoroughly well mixed add the back fat, which should be either cut into small pieces by hand or cut through a fat cutting machine. Sometimes it will serve to cut it up into pieces of about two inches square and simply put it into machine at this stage, but it is much more desirable to have the fat cut into pieces of the proper size, and then added to mixture. The proper size is about half-an-inch square. After adding to mixture give machine a few turns so as to mix the back fat and other ingredients, then stop the machine, withdraw the mixture, and fill by means of sausage filler, with a big funnel, into ox-bungs—preferably the "cup" ends.

When the sausages are filled and properly tied, a piece of stout string should be tied round each end so as to form a loop to lift them by. Drop them into jacketed pan or copper, in which the water is not quite boiling (or about 180° F.), and allow them to *simmer*, not to *boil*, for two hours, then withdraw them. Should they be very large, however, they will require about three hours.

Before taking them out of copper it is necessary to have the dye ready. It is prepared thus:—

Take a barrel, or tin vessel, of about twenty gallons capacity, and into this put 4 ozs. of brown German dye; add to this 4 ozs. food preservative (dry antiseptic), and then put in about sixteen gallons of hot water and stir up. Every time this dye has to be used it must be heated, but it does not need to be boiled, and a very good plan for getting the proper heat is to lead a steam pipe, if such is available, into the barrel, and by this means heat the solution when required. It is not necessary to have *all* this quantity of solution so long as the proportion of 1 oz. dye and 1 oz. preservative to four gallons of water is kept. A smaller quantity is easily heated on the fire, or by putting the vessel containing it on the side of copper while the German sausages are being cooked.

It is also necessary to have a tub or barrel for cooling and fixing the dye. An ordinary butter keg of about 1 cwt. size will answer this purpose. Into this put 2 lbs. of alum and fill up with cold water to within six inches or so of the top. The solution should always be kept cold, as the colder the temperature the better is the fixing property, and in this way the dye will be prevented from going through the skin.

The Process of Dyeing the Skins—As soon as the sausages are withdrawn from the copper or jacketed pan, dip them into the warm solution of dye, and let them remain for two or three minutes. Remove them after that time, dip them into the fixing tub, and allow them to remain about the same time there. Remove the sausages, lay them on a rack with shelves made of wire netting, and allow them to cool. Or perhaps the better plan is to tie a cord round the sausage and suspend until cool and dry.

To Brighten the Skins.—When cold, it will be found advisable to rub the skins with a cloth on which a little salid oil has been poured; this will brighten them, and they will then be ready for sale.

Note on Bungs.—Ox-bungs are to be bought either cured in salt or in the dried state. In the dried state they keep much longer than in salt. The salt is apt to make little holes through the skins after a time and so render them useless. In the dried state they ought to be kept in a dry place, so as to prevent their being attacked by maggots, and they should also be kept in a place where mice will not get at them, as they are very partial to nibbling them all round the edges.

German Sausage.—(Another Recipé).—

15 lbs. bull beef.
10 ,, salt American pork.
12 ,, back fat.
12 ,, farina.
3 ,, sausage meal.
8 ,, water.
4 ozs. white pepper (No. 2 super).
1 ,, ground ginger.
2 ,, dry antiseptic.
2 ,, ground corianders.
¼ ,, ground cayenne.
1 ,, ground nutmegs.
1 ,, ground sage.
3 ,, powdered saltpetre.
¼ tea-spoonful Armenian bole (No. 1).
2 tea-spoonfuls cane sugar (dissolve in hot water).

Method of Preparation.—Chop beef in machine till fine, adding seasoning during process, then throw in pork until the whole is cut fine. Mix farina with water and pour it in, then put in the back fat (having cut it into squares, as described in previous recipé), and mix the whole well together. Remove from machine, and fill out into bungs. Hang the sausages in the open air until the skin is well dried, and then smoke them well. On withdrawing them from smoke house, place in copper, and boil for two hours at a temperature of 180° F.

These German sausages will keep for some months in good condition.

It may be remarked that no salt is added as the quantity derived from the salt pork is enough. Should, however, it be deemed necessary to add to this, a handful thrown in, with seasoning, will suffice.

Note on above Recipé. — This sausage is of very good quality and well suited for a good trade. The price ought to be about 6d. per lb., and the cost may be seen from the following statement:—

		s.	d.
15 lbs. beef, at $4\frac{1}{2}$d per lb. -	-	5	$7\frac{1}{2}$
10 ,, salt pork, at 3d. per lb.	-	2	6
15 ,, farina and sausage meal	-	3	$1\frac{1}{2}$
12 ,, back fat, at 5d. per lb.	-	5	0
Seasoning, bungs, and labour -	-	2	6
		18	9
60 lbs. produced at 6d. per lb.	£1	10	0
Profit -	-	9	3

German Sausage Machine.—see Brawn Meat Cutter.

German Sausages, to cook.—see Steam Cooking.

German Smoke Ovens.—see Smoke Ovens (German).

Gestation Periods of Domestic Animals, and of Incubation of Poultry.

	Shortest Period. Days.	Mean or Usual Period. Days.	Longest Period. Days.
Mare -	322	347	419
Ass -	365	380	391
Cow -	240	283	321
Ewe -	146	154	161
Sow -	109	115	143
Goat -	150	156	163
Bitch -	55	60	63
Cat -	48	50	56
Rabbit -	20	28	35
Turkey sitting on the eggs of the Hen	17	24	28
Turkey sitting on the eggs of the Duck	24	27	30
Turkey sitting on the eggs of the Turk'y	24	26	30
Hen sitting on the eggs of the Duck	26	30	34
Hen sitting on the eggs of the Hen	19	21	24
Duck -	28	30	32
Goose -	27	30	33
Pigeon -	6	18	29

Giant Sausage of Konigsberg.—The revival of trade after the long stagnation which followed in the wake of the crusades, was responsible for many fantastic procession freaks in the larger towns of Western Europe. For instance, we are told that in the new year's procession at Konigsberg, in 1558, a Bologna sausage exhibited by the "butchermen" was 622 feet in length, and was carried on the shoulders of sixty-seven men and boys. The one exhibited in the same city in the year 1583, was over 1600 feet in length, and weighed 434 lbs. But the giant of all sausages, and perhaps the largest thing of the kind ever made, was exhibited by the Konigsberg butchers on new year's day in 1601, when they paraded the streets with a Bologna nearly three-quarters of a mile in length, and weighing 2000 lbs. It was carried on the shoulders of 187 men, the first and last in the column each having it wound round their necks.

Gilled Pipes.—see Drying Room.

Ginger.—The consumption of ginger in Great Britain amounts to a big item. It is one of the most useful spices we have. It is the root of the ginger plant which is so largely grown in the East and West Indies, Brazil, and the West Coast of Africa. There seems to be some doubt as to what part of the world it is native. It is claimed as indigenous to China and also to Guinea. Ginger is used largely in cakes, gingerbread, sauces, spiced wines, and a variety of pleasant eatables and drinkables. It has a stimulating effect on the stomach, and in hot weather or in hot climates where decomposing food is often eaten, it forms a pleasant corrective.

In Jamaica, propagation is done by sub-dividing the root; each piece planted throwing up two different stems. The first bears the leaves and rises sometimes to the height of about three feet, though usually it does not exceed eighteen inches; when this spreads its leaves and is in full perfection, the second stem springs up—the top of which carries a roundish scaly flower-spike. The plant flowers about September and fades again towards the end of the year; and when the stalks are withered the root is considered to be full grown. They are dug up, picked, cleaned, and gradually scalded in boiling water, and are then dried in the sun until they are ready for packing.

In the Dacca district of India, the natives cleanse the roots in boiling lime water, but this process is supposed to destroy much of the natural flavour.

Glaze Colour.—Sometimes called Parisian Essence, is a deep brown colour of vegetable origin used for giving the colour of gravy to jelly used for dressing pressed beef and other cooked goods. It is also used for colouring soups.

The directions for use are as follows:—Take two parts gelatine and one part glaze colour, and dissolve in five parts of boiling water, then apply in the usual way.

Glazing for Hams, Tongues, etc.—Boil a shin of beef and knuckle of veal for twelve hours in four gallons of water, adding salt, pepper, and a few cloves, strain the liquor and skim off all fat, return meat from shin of beef to strained liquor, and simmer down to one quart of liquor, withdraw shin meat and add two ounces burnt sugar; when wanted for use warm a portion and paint on with a feather. It will keep good for twelve months.

Glue.—see Gelatine.

Goats in Cape of Good Hope.—see Cape Colony.

Goats in Natal.—see Natal.

Goats in South Australia.—see South Australia.

Goats in Western Australia.—see Western Australia.

Gob Hook.—see Hooks.

Goose Brain Sausage.—Chop together 95 lbs. of beef, 5 lbs. of suet; mix with it 42 ozs. salt, 14 ozs. ground white pepper, 1 glass madeira, in which garlic has soaked; also the chopped lean meat of a well fried goose. Stuff in hog bungs or beef middles, and proceed the same as in Pork Cervalat Sausage.

Goose Liver Sausage.—see Liver Sausage.

Granulated Rice.—see Rice.

Gravy Preserving Powder.—A harmless, tasteless, inodorous preservative, very useful for keeping gravies. It is a white soluble powder and should be added at the rate of 1 oz. to the gallon of gravy.

Grease Proof Paper.—see Wrapping Papers.

Grindstones.—Made from natural sandstone formed of sharp grit, which has the properties of grinding or abrading hardened steel and other hard metals and substances. Grindstones are a circular form of this stone, mounted on spindles to run true and are rotated by means of a handle, treadle, steam, gas, or other power. When used by hand or foot power they can only be revolved at a slow rate, and in consequence it takes longer time to do the required work as compared with power stones, but notwithstanding this, the hand machines are extremely useful where only a small amount of grinding has to be done.

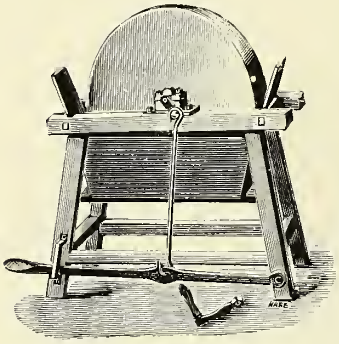


Fig. I.
Grindstone mounted on Wooden Frame for Hand and Treadle Power.

When a large amount of work has to be got through it becomes necessary to run the grindstone at a much greater speed, and this can only be effected properly by steam, gas, or other power. Good stones can be safely run up to 3000 surface feet per minute, so that a simple calculation gives the speed that any size of stone can be worked; a stone 5 feet in diameter would measure 15 feet in circumference; therefore, dividing 3000 by 15, gives 200 as the revolutions at which it is safe to run the stone. This speed should never be exceeded, as centrifugal force soon becomes greater than the cohesive power of the stone which then bursts and a serious accident may be the result. It is not an unusual occurrence for a stone to burst in this way owing to the speed being excessive.

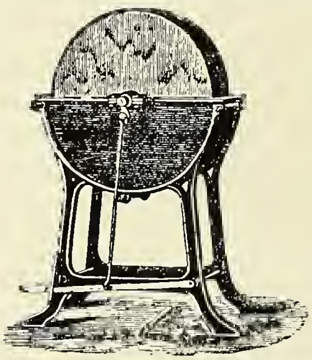


Fig. II.
Iron Frame Grindstone with Handle and Treadle.

The most useful grindstones for general work are the best quality Yorkshire, Blue Grit (a finer description of stone), and Bilston stones. These latter are only obtainable now in very small sizes.

For rough grinding, Derbyshire and Newcastle stones are largely used, but these are liable to spoil the temper of tools and are therefore not much used for tool grinding.

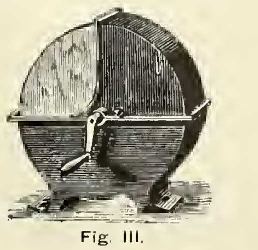


Fig. III.
Bench Grindstone with Iron Frame and Half Cover.

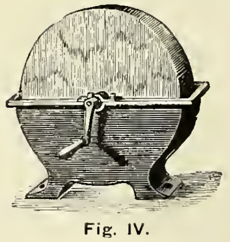


Fig. IV.
Bench Grindstone with Iron Frame.

Grindstones can be had usually in any required dimensions from 6 ins. up to 6 ft. diameter.

Groats.—Used largely as ingredients in black puddings; they are very nourishing and palatable and add greatly to the value of the pudding. The process of manufacture is similar to that of oatmeal except the grinding (for description see under Oatmeal).

Grocers' Associations.—see Federation of Grocers' Associations of the United Kingdom.

Ground Rice.—see Rice.

Guts.—The defination of the term as used by hog packers is—everything inside a hog except the lungs and heart, or in other words, the abdominal viscera complete. The material is handled as follows:—

When the hog is split open the viscera are separated by cutting out the portion of flesh surrounding the anus, and taking a strip containing the external urino-generative organs. The heart is thrown to one side and the fatty portions trimmed off for lard. The rest goes into the offal tank or sausage. The lungs and liver go into sausage. The rectum and large intestines are pulled from the intestinal fat and peritoneum, and, along with the adhering flesh and genito-urinary organs, sent to the trimmer. All flesh on the above-mentioned organs are trimmed off, and the intestine proper is used for sausage casings. The trimmings, including the genito-urinary organs, are washed and dumped into the rendering tank. The small intestine is also pulled from the fatty membranes surrounding it and saved for sausage casings. The remaining materials, consisting of the peritoneum, diaphragm, stomach, and adhering membranes, together with the intestinal fat, constitute the "guts," and undergo the process of washing, which is conducted usually in three or four different tanks.

As the "guts" pass into the first tank the stomach and peritoneum are split open, and also any portion of the intestines which sometimes adhere to the peritoneum. After receiving a rough wash they are passed from tank to tank, when, after a third or fourth wash, they are ready for the rendering tank. The omentum fat is cut from the kidneys, and the kidneys with a little adhering fat go into the rendering tank. Spleen and pancreas go into the rendering tanks, as do also the trachea, vocal chords, and œsophagus.

To sum up, it is safe to say that everything goes into the rendering tank, with the following exceptions:—

1. The intestines proper, which are saved for sausage casings.
2. The liver and lungs.
3. That part of the heart free from fat.

HAGGIS (Scotch).—Take fresh killed sheep's stomach; wash well and soak for two hours in cold salt water. After which clean by immersing in scalding water of 150° F., and scrape with a knife till all excrement is removed, and the stomach appears clean and white. Leave it immersed in clean water until wanted for use.

Take sheep's pluck and clean it thoroughly—washing free of all blood—boil the liver and lights fifteen minutes, then change the water. Add the pluck and boil for an hour and a quarter. Trim away skins, gristle, or discoloured parts, grate half the liver, chop the pluck fine with 1 lb. suet,

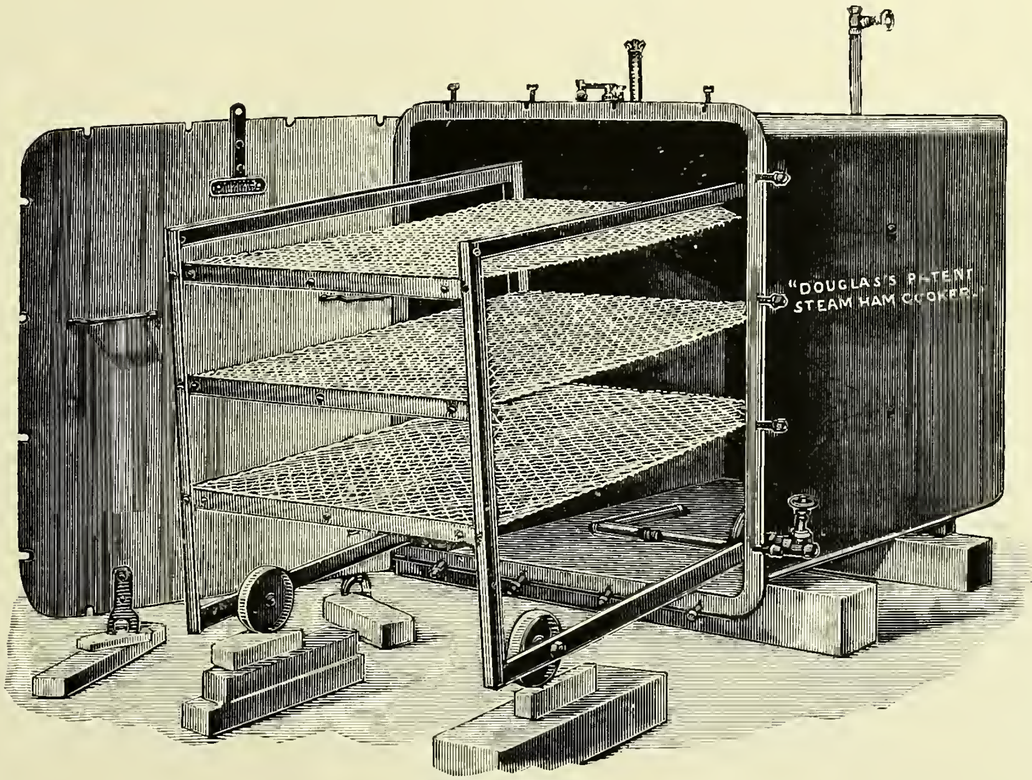
1 onion, 2 tea-spoonfuls salt, 1 tea-spoonful pepper, ½ nutmeg, grated, a grain of cayenne, and 2 lbs. oatmeal. Moisten with about a pint of good gravy made from bones. Mix thoroughly and sew up loosely in the stomach (to allow for swelling). (The stomach may be cut into any size required, if a full sized haggis is not wanted). Boil gently, first pricking well to let out the air; 1 lb. sizes require about forty-five minutes, and larger sizes in proportion.

Haggis should be served as hot as possible without sauce or gravy, and should be boiled for twenty minutes before serving.

Scotch haggis although apparently simple, is difficult to make to suit the public taste, and requires great care and a considerable amount of judgment on the part of the manufacturer.

to cover the pieces. Then pour very carefully till the brine is one inch higher than the meat, then cover it and let it lie twelve days. If a large quantity is salted at once, it has to remain for three weeks in salt. Then take it out and let it lie for six days. Wash it, then dry with a dry napkin, and hang it up for twenty-four hours outside; afterwards smoke it for several days.

Ham (Calves).—Take the ham of a calf two months old, remove the bone, rub with 17 ozs. salt, 2 ozs. pulverised sugar, place in a vessel and pour over it a pickle consisting of 15 ozs. salt, boiled in five pints of water, let it remain for two weeks. Wash clean, and smoke for twenty-four hours. The same process may be followed for pickling and smoking beef tongues.



Steam Ham Cooker.

Hams, Broth for Boiling.—Place 1 lb. each of beef, pork, veal, and mutton in cold water, heat gradually, and boil half an hour, remove the meat and boil your hams in this broth for an hour and-a-half, allowing them to cool in it; when cold remove and sprinkle the fat with ground pepper. The best hams are from the young pig.

Ham Brander.—see Bacon Brander.

Hamburg Municipal Knacker's Yard.—see Municipal Knacker's Yard, Hamburg.

Hamburg Smoked Meat.—From a good ox take the thick part of the leg and the tail piece, about 6 to 8 lbs., and cut them into pieces four inches broad and fifteen inches long, taking away all bones, and that before weighing. Rub them with salt to which has been added a little cane sugar. Pack all very tight into a salting tub, pour afterwards from one side enough aromatic salt brine

Ham Cooker's Tools.—see Ham Cooking.

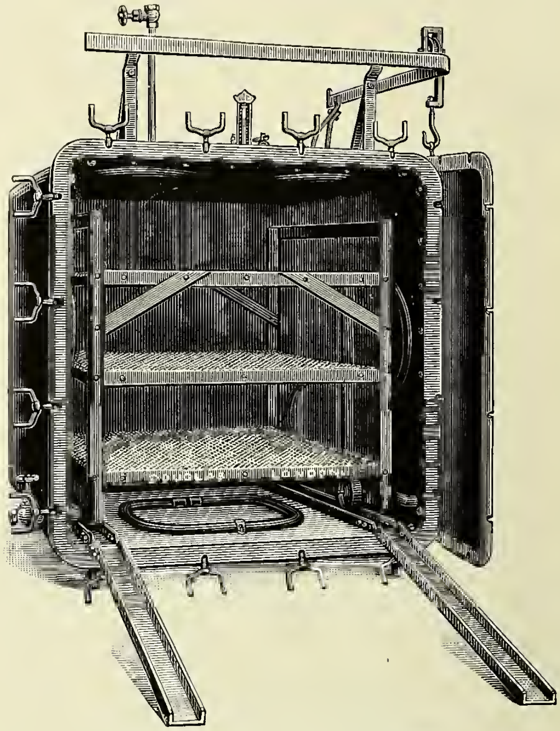
Ham Cooking.—The great strides which ham cooking as a separate industry has taken during late years, has led many to consider whether boiling could not be superseded. The process of cooking hams in many places at present is something like the following:—Large coppers or ordinary fire heated pans are erected in the corners of cellars or other out of the way places, the iron coppers having capacities ranging from 50 to 150 gallons. These coppers are built all round with massive brick work, the flues being led so as to get the greatest amount of heat out of the fuel. They are built in, so that the heat left in the brick work should continue the process of simmering after the fires are drawn. A common way is to fill up the copper about three parts full with water, and throw in a few lbs. of fat, so as to form a fat film on the surface, and so prevent evaporation of the water. The hams are thrown in and the fires kept going

until the temperature is constant at 180° Fahr. The fires are then drawn, a lid or cover is placed over the copper, and the openings are covered up with bags or anything handy. The hams are then left till morning. They are then fished out and may be sent out immediately. This process is called "simmering," and is said to be satisfactory. A copper with its liquid is heated over and over again for about a week on end, and much fat has to be skimmed off during that time. The liquid is renewed only when it becomes foul.

The objections to this system are, that it is sloppy and dirty, it takes a long time, and the juices of the hams become mingled with the boiling water and are lost. Cooking by steam has none of these disadvantages, as will be seen.

The only successful system patented for steam cooking of hams is that of Thomas Douglas, and during late years it has been adopted by many large users. There are in England many ham cookers, who cook up to 2000 hams per week; there are a great many more who cook up to 500 per week. For these, therefore, especially a rapid clean, and economical process is essential. Such is the process we will now describe.

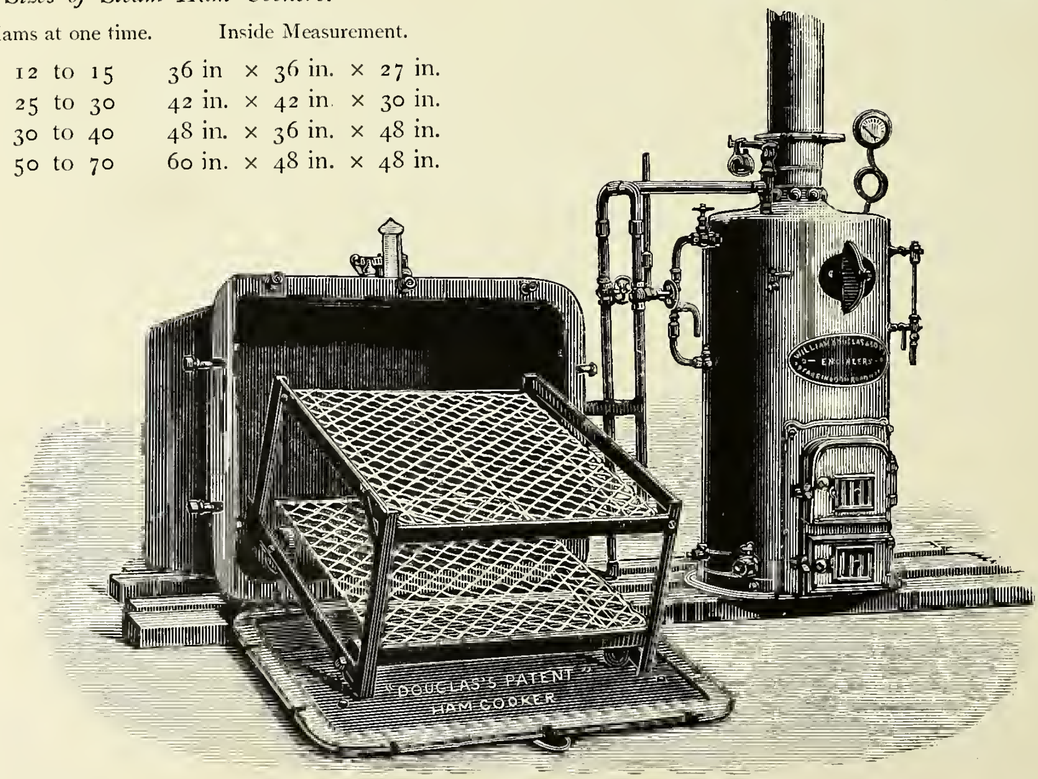
The steam ham cooker is made in various sizes, and these increase according to the numbers.



Steam Ham Cooker with Improvements.

Sizes of Steam Ham Cookers.

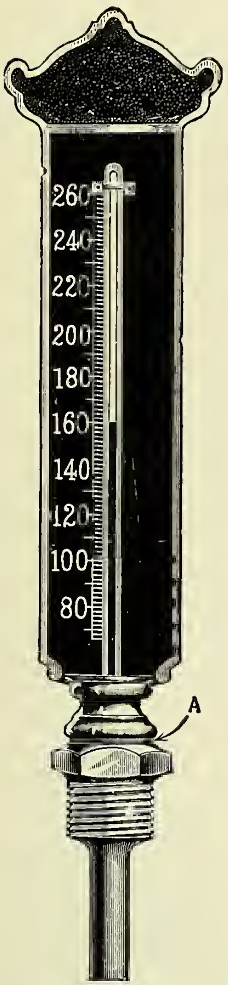
	Capacity in Hams at one time.	Inside Measurement.
No. 1	12 to 15	36 in × 36 in. × 27 in.
No. 2	25 to 30	42 in. × 42 in. × 30 in.
No. 3	30 to 40	48 in. × 36 in. × 48 in.
No. 4	50 to 70	60 in. × 48 in. × 48 in.



Combined Steam Producer and Ham Cooker.

The designs include some fittings not shown in the first ones made, such as folding down cage rails and travelling overhead bar with brackets for carrying running hook, to which the door is suspended. This arrangement enables the door to be thrust round the side out of the way.

The cooker is composed of steel plates, either welded or riveted together. It is made in a rectangular shape, and on sides and top are continuous high pressure coils for steam. On the bottom is another coil, but it has perforated holes so that wet steam can pass through in this way into cooker.



Metal Cased Thermometer on Ham Cookers.

The coils round the sides and on the top are meant only for giving off heat, so that the full pressure of the boiler may be on them. But the perforated bottom coil only requires a very small supply of steam. The theory is that the cooking is really done by the dry coils, but roasting would take place if wet steam was not also present. Hence both are supplied.

The wet steam is regulated by a small blow-off cock, which blows off at $1\frac{1}{2}$ lbs. pressure per square inch, and so prevents disintegration of the hams through a heavy rush of steam impingeing against them. The temperature is the all important thing, however, and this is regulated by means of a metal cased thermometer, which is fastened on top of cooker—the bulb being inside.

A convenient arrangement for small work is shewn on page 190. It includes a small steam producer which may be set down beside the cooker, and is very convenient.

The following are useful Instructions for fitting up Douglas's Patent Steam Ham Cooker.—The cooker should be placed in any suitable position as near the boiler or main steam pipe as possible. It is usually placed with the back about twelve inches from the wall, so that a man can get behind to re make any pipe joints when necessary. In selecting a position for the cooker, care should be taken that sufficient space is left to draw out the cage, and also space enough on the right hand side to allow cover to swing round.

The steam and exhaust pipes must be connected up as marked on the sides and back of cooker, and the safety valve and thermometer as marked on top.

The steam coil outlet and the wet steam outlet should be conducted so as to exhaust into a hot well or into the atmosphere.

In starting the cooker, steam should be allowed to pass freely through the coil, in order to expel all water, then gradually close the valve on the outlet side until the required temperature is reached. The wet steam valve should be opened as soon as the hams are put in and the door bolted on, and should be regulated during the cooking according to the class of hams.

The fitting up of the cooker is so simple that any mechanic can do the work in a few days.

The cooking temperature for hams varies from 180° to 200°, according to the size; and length of time for cooking varies from $3\frac{1}{2}$ to 5 hours.

A duplicate cage is generally desirable, so that while one cageful of hams is being cooked another may be cooling.

There are two wheel valves attached to each apparatus. One of these is for regulating the steam supply to a coil of steam pipes which is fixed closely round the shell of the apparatus, and this coil is for producing *heat alone.* The outlet from this coil is at the bottom of the apparatus, and should always be left open a little bit—just sufficient to allow of the condensed steam running away freely without any live steam escaping.

The second wheel valve is to regulate the live steam supply to a steam spray which is placed on the bottom of the vertical apparatus, or the lower side of the horizontal apparatus. The safety valve on each apparatus is set to blow off at $1\frac{1}{2}$ lb. The carriage or cage in each apparatus is for carrying the hams to be cooked, and they may either be laid on wire netting shelving or hung from the bars.

The best appearance is obtained by first wrapping the hams in cloth—thick cotton—and then putting them on the cage. The skins should, if possible, be left on and removed after cooking. As soon as they are removed, dust on roasted bread crumbs (No. 2 ham dressing). The time required for cooking hams is approximately as follows:—

12 lb.	hams nett,	without bone,	if cooked at	200° F.,	require	3 hrs.
12 ,,	,,	,,	,,	180° F.,	,,	4 ,,
12 ,,	,,	,,	,,	170° F.,	,,	5 ,,
14 ,,	,,	,,	,,	180° F.,	,,	5 ,,

It will be observed that a cased thermometer of special design is fixed on each apparatus. It is by this instrument that the cooker must be regulated, and the supply of steam gauged. The thermometer accurately records the temperature which is controlled by the wheel valves already referred to.

The process of handling hams to be cooked, entails a lot of labour, and there are required the following handy tools so as to facilitate the work:—

"T" head pin.	Lacer (straight eye).
Rolling pin.	Scraper.
Boning knife.	Stringer.
Working knife.	Ham needle, 14 in.
Lacer bent eye	Ham needle, 18 in.

Hams come to England mostly from the United States in great quantity. These American hams are what are used by ham cookers, principally, because they are cheaper than the English product. There are many American makers who have what they term "brands," and the hams may either be "fatless" or entire. When they arrive, they have to be boned, and it is in this and the subsequent processes, that profit or loss may be made. It is always best to employ a skilled boner, as otherwise much meat may be left on the bones, which means loss. The next thing to watch is the cooking. High temperatures are wasteful in weight. Fat runs off the hams and so is lost.

Here are some records of actual cooking, and the only thing remarkable about them is their total diversity and inconclusiveness.—see next page.

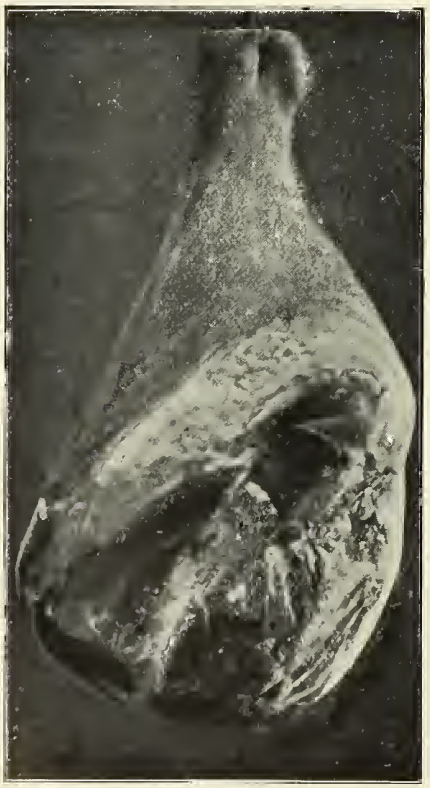
We shall require to have data extending over a long period before generalising in this matter.

The appliances convenient in a ham cooking establishment are:—

Steam boiler.	Fat cutter.
Ham Cooker.	Mudgeon vat.
Bone digestor.	Lard press.

The bone digestor, fat cutter, mudgeon vat, and lard press enable all the bye-products to be worked up into profitable substances, instead of their being wasted and thrown away. The secret of profitable ham cooking lies in looking after the bye-products and preventing waste.

Cooked in.	Description of Ham.	No.	Weight put in.		How Dressed.	Weight after Cooking and Cooling.		Temperature of Cooking.	Length of time taken in Cooking.		Loss in Weight.	Remarks.
			lbs.	ozs.		lbs.	ozs.		H.	M.	%	
Douglas Cooker	Boneless	36	502		In muslin bag	455		184°	4	30	9·36	Not sufficiently cooked.
		38	524		Do.	439		188° to 204°	5	30	16·22	Flavour good, but rather over [cooked.
		35	461		Do.	408		185° to 188°	4	30	11·83	
Open Pans -	Do.	35	481		Do.	418		180° to 212°	6	0	13·09	
Douglas Cooker	Do.	1	13	6		11	8				14·01	
		1	13	9		10	9				22·12	
		1	14	3		12	9				11·45	
		1	13	3		11	3				15·16	
Open Pans -	Do.	1	13	3		11	6				13·74	
		1	13	9		11	9				14·74	
		1	12	4		10	9				13·77	
		1	13	1		10	15				16·26	
Douglas Cooker	Do.	2	22		Without any cover	20	4	190°	4	15	7·95	Done sufficiently.
Do.	Skinless	10	110			83½		185° to 192°	3	2	24·09	Hams were very moist before [cooking.
Do.	Boneless	5	65		Tied with string	54¼		190°	4	5	16·38	
Open Pans -	Do.	10	133		Do.	96					27·81	
Douglas Cooker	Do.	12	137		Without any cover	115		180°	4	45	16.05	
Do.	Boneless, skinless, & fatless.	6	60		Do.	51	6	200°	3	0	14·37	



Smoked Ham.

Ham Curing.—The curing of hams is carried on in various parts of the United Kingdom, by methods which all have a strong resemblance the one to the other. Hams are cured largely in Yorkshire, Suffolk, and the Eastern counties of England, Cumberland, Ireland, and to a limited extent only, in Scotland.

The "cure" is practically the same everywhere, but it may be varied to some extent to suit local fancies. Thus, in Ireland a very large quantity of hams are cured for export to France as York hams. These hams are small—averaging 12 lbs. in weight—aud mild cured. They are smoked lightly and are meant for quick consumption. In Yorkshire the ham cured is of a heavy character, averaging 30 to 50 lbs. in weight. It is altogether a very salt ham. In Suffolk the hams cured are sometimes very small, and they are smoked until nearly black. In Scotland ham curing does not exist to any great extent,

No. 1 Recipé.—For curing hams where the legs of pork are bought by themselves. In such establishments only legs of pork are handled, and these are purchased from those who handle the whole pigs.

The general conditions under which hams may be successfully cured, may be stated as follows :—

1. The fresh hams should be chilled to a uniform temperature of 38° Fahr.

Pale Dried Ham.

A Suffolk Ham Factory

A Suffolk Ham Factory.

2. The curing cellar should have a constant temperature varying between 40° and 42° and should be humid.

Primarily it may be stated that there is some disadvantage in collecting hams at a distance from the curing factory, inasmuch as in warm weather there may be some of these of high temperature and predisposed to taint. That difficulty may be minimised by instructing the consigners of the hams to press out the excess of blood from the blood veins and to dust the hams over with food preservative (dry antiseptic). When the hams are received, they should all be pressed to see if any excess of blood remains in the blood vein. If there is any pressed out, it should be wiped off with a damp cloth which has been soaked in a solution of 1 lb. dry antiseptic to 1 gallon of water.

The hams should be hung up in a chill room where there is a constant circulation of dry cold air, and the temperature of the room should not be allowed to exceed 38°.

The time which the hams are allowed to hang in the chill room must be regulated by means of the meat testing pocket thermometer. This little instrument is pressed into the ham and the temperature then read off.

As soon as the hams are sufficiently chilled, they are nicely trimmed and shot down into the curing cellar, never getting into the outer atmosphere again until they issue, cured.

The hams, as soon as they reach the cellar, are at once plunged into a pickle formed as follows :—

Recipé for Purging Pickle for Hams.

Take the following quantities—

55 lbs. salt.
5 ,, saltpetre.
5 ,, dry antiseptic.
5 ,, pure cane sugar.

And add sufficient water to make a total bulk of 20 gallons. Stir all together and wait till all is dissolved. Allow to settle, and when clear, decant off the liquor into pickle tanks in the cellar. Another way of treating this liquor so as to clarify it is to boil it till clear.

The liquor, however made, is run into the pickle tanks which are made of a convenient size and placed in the cellar. The pickle should be allowed to remain there until on the floating thermometer it registers 40° to 42° F. The density should be about 100° on the Douglas salinometer.

Plunge the hams into this pickle and keep them down beneath the surface by means of a hard wood grating on which stones or weights are placed, Take the hams out the following day after they have been put in, and squeeze them so as to rid the blood vein of final traces of blood.

Immediately then lay the hams on cellar floor, or on slate or flag stone shelving, which may be also used in cellar. Put a bank of salt about four inches high along the line where hams are to be laid, and place the thick end of the hams with rind downwards on this bank pointing the shanks downwards. The shanks should touch the floor. The hams should be laid down symmetrically all in line, and with the shanks at equal distances apart and pointing diagonally to the bank of salt.

When the line is complete, lay a long lathe of hard wood on the shanks and fill the spaces with salt, then proceed as before. This process is carried out until each day's hams are laid down. Each day's hams should be kept separate in a square or other section by themselves, and a lane provided between them and other day's hams. A tally bearing date and other particulars should be placed in each section.

When the hams are being laid down in the way described, each line should be salted in the following manner :—

Prepare an equal mixture of dry antiseptic and granulated saltpetre, and sprinkle this mixture lightly with a horse-hair sieve all over the cut surface of the hams. Take an extra pinch of the mixture and press it into the blood vein opening. Now cover the whole over with fine salt—a layer of half-an-inch at least is necessary.

This treatment should be followed with each row of hams. The remainder of the process of curing must be regulated to a large extent by judgment.

If the hams are averaging 14 lbs. in weight, they may be taken out of salt in fifteen days from date of putting in. These hams will be mild cured and must be consumed immediately. If, however, keeping hams are wanted, then 14 lb. hams will require twenty-one days for the cure, and many people would keep them thirty days. It depends altogether on the market to be supplied. The old fashioned farm-cured York ham would be allowed to remain in salt thirty days if 14 lbs. in weight.

For modern curing it is safe to say that 1 lb. in weight requires one day in salt to cure for hams for immediate consumption. But where hams are to be kept until they develop a "bloom," then two days per lb. weight is the rule to follow.

When the hams are cured, they are taken up and washed in luke warm water, and are then hung up in a drying room kept at 85° Fahr. to dry. About two to three days will be sufficient length of time required for drying, but this again is a matter of judgment. To make pale-dried hams look *white*, plunge them for a few seconds in boiling water (212° Fahr.) and then proceed to dry them.

If the hams are wanted smoked, they are hung up in a properly constructed smoke-stove with the heat capable of being regulated. This regulation is effected by means of steam gilled pipes. The temperature of the smoke-stove should not exceed 90° Fahr. The smoking material may consist of any hardwood sawdust. This is spread over the floor of stove and lighted either in centre or at four corners.

In Ireland, peat is frequently used for smoking. It gives a rich flavour much appreciated by connoisseurs. Smoking requires generally about three days.

To put the final gloss on smoked hams rub the skin well with a cloth on which there is some vaseline. Hams for shipment to France must not be cured by the aid of dry antiseptic or by anything except salt, saltpetre, and sugar.

No. 2 Recipé.—For curing hams by the wet process.—The curing of hams in the old fashioned way is rather a complicated matter, and the old notions have long ago been exploded. Thus, it was the custom to rub the skin every three or four days ; this custom has been proved to be simply waste of time, as no effect takes place at all. What is required is as follows :—

To Cure Hams.—See that the ham is pretty free from blood in the blood vein, and then throw into a pickle composed of—

50 lbs. salt.
5 ,, saltpetre.
5 ,, antiseptic.
5 ,, sugar.

A Suffolk Ham Factory—Cutting-up Department

Pale Drying Hams.

Made up to twenty gallons with water, and boiled until pretty clear. As this pickle purges the hams it will become vitiated with blood and organic matter. When this is so, boil again adding salt and other ingredients in proportion as the pickle becomes weak. The strength should be maintained at about 95°–98° on the Douglas salinometer. The above pickle is the first or purging pickle only, and is kept solely for that purpose.

After the hams have been in this pickle for about twenty-four to thirty-six hours, according to size, take out and press out the remainder of blood from blood vein.

Now, you may throw the hams into a fresh pickle in another tub, the pickle being made exactly as the former one, but to this may be added a bag containing some juniper berries and some coriander seeds—about 2 lbs. of each to about twenty gallons. Some people also add bay leaves for the bitter flavour, so much admired in Westphalian hams. The hams may be kept in this pickle for about twenty-one days if averaging, say 15 lbs. in weight, longer if heavier, and shorter if lighter in weight. They are then removed and dried, either pale dried in a room kept at 85° Fahr., or dried and smoked in a smoke-house; the material used for smoking being oak sawdust, the temperature 85° F., the length of time in drying three days. This completes the "wet cure."

No. 3 Recipé.—For curing hams by the dry process (West of England).—Clean the floor of your cellar, lay your hams out flat on the floor skin downwards. Get some finely powdered saltpetre in a small sieve, and dust the faces of the hams over with it. Then sprinkle over with fine dry salt (to have salt perfect, keep it in a dry place). Let the hams lie until the next day, then take each ham, brush off the old salt (never leave any old salt on, for the salt is spent and has done its work, tainted hams are caused by leaving a quantity of spent salt on them). Get some fine dry salt to which add five per cent. saltpetre, five per cent. dry antiseptic, and six per cent. best raw sugar. Get your ham in a trough or something of that sort, to save your salt from being wasted on the floor. Get some of the mixture and rub very hard into the thick part and back of ham, pressing down with the blood vein on the flank side of aitch or lift bone, until you see the blood run out from cud of the vein. If the blood does not come out freely, serve the same way next dressing. If you intend to lay your hams from the back wall of cellar, or say from any part of cellar, get a long piece of timber three inches thick (hams should never be laid flat after the first rubbing), then start laying the thin end of hams on timber, hock slanting downwards on to the floor. Place hams close together when your row is finished; place the thin ends of next hams on top of first hocks and so on. By being placed in this position the melted salt runs into the thick inside of ham, if laid flat the salt would be half wasted off the sides of ham. Your floor should be well covered with dry salt before laying your hams on. When you have laid your first row, sprinkle over with your salt, etc.; serve every row the same way. Let them remain two days. Then rub them with a coarse brush to clean off all spent salt, and rub them in same manner as before. Let them remain another four days, and brush old salt off again. No more rubbing is required. Sprinkle over with fresh salt, and let them remain for another week. Then brush off old salt, and sprinkle with a good layer of coarse salt and five per cent. of dry antiseptic powder. Let them lie until their time for curing is out. Hams of 14 lbs. to 16 lbs. take twenty-one days. Larger hams according to weight. When taken out of cellar for drying, wash in warm water, trim them nicely, then pump them—that is, dip them in boiling water for the double purpose of making them look white, and drawing out the wrinkles in the skin, and to give the skin a smooth polished appearance.

To Smoke Dry-Cured Hams.—When dry-cured hams are needed for smoking, steep them in cold water for six hours then pump them, trim and hang in smoke for about three days, according to colour required.

Pumping Hams.—The old way was to drop the whole ham into boiling water for a few minutes. Now, this was altogether wrong, for the boiling water hardened the lean on the face of the ham, and, in a few days drying, went hard and dark coloured. Now hams, especially when smoked, require the lean to look a nice bright cherry red colour, and free from that dark crusty outside. Dip the ham knuckle end first into the boiling water, not allowing the water to touch the lean face of the ham, and withdraw it again. The wrinkles, if any, will be smoothed out, and the fat will be nicely white and firm. The lean will not be darkened.

Ham Dressing.—A dry friable powder made from flour baked and calcined. It is used extensively for dusting on the surface of boiled or steamed hams, so as to suck up the free globules of fat that are present, and also to lend to the appearance of the ham.

Ham Drying Pipes.—see Drying Room.

Ham Frills.—Ornamental pieces of frilled paper used for decorating shanks of cooked hams.

Ham in Bladders.—Take hams too fat for ordinary use. Separate the meat from the bone, trim the ham nearly round, leaving one inch of fat, pack and pickle the same as with ordinary hams, then wash clean and put in hog bladders, tie up and hang in the smoke for two weeks.

Hams (Deer).—Use the ham of a deer, remove the bone, rub with 17 ozs. salt, 2 ozs. pulverised sugar, place in a vessel, take 24 ozs. salt, a very small quantity cloves, ginger, sage, and juniper berries, boil in five pints of water, when cool pour this over the ham, let it remain covered with the pickle for one week; remove and smoke. They may be eaten raw, or boiled in broth for two or three hours.

Hams for Drying.—see Drying.

Hams (Pickling).—*No. 1 Recipé.*—Remove the hams twelve hours after killing, each ham is thoroughly rubbed with 2½ lbs. salt, 1 oz. saltpetre, and put in a water-tight cask. If the hams are closely packed, enough brine will form from themselves to cover them, but if more brine be needed use 17 ozs. salt boiled in two quarts of water. Allow them to remain covered with pickle for three weeks, then take out, wash and hang in the air for several days. Smoke for three weeks.

No. 2 Recipé.—To each ham use 1 lb. salt, ½ oz. saltpetre, 2 ozs. sugar, rub well and lay in a water-tight cask. Add 1 lb. salt, 2 ozs. juniper berries, ½ oz. pepper, ½ oz. cloves,

all whole, and boiled in two quarts of water. When cold, pour over the hams; a small quantity of garlic may be added if wished. Allow the hams to remain under the brine for three weeks, then remove, wash and hang in the open air for eight days. Smoke for three weeks. If the hams are to be immediately boiled, three days smoking is sufficient.

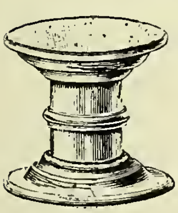
Ham Roll.—From either a hind leg or fore leg of ham remove the bones and rind. If it is a hind leg, cut it so that it is in one large thick piece. Lay this piece or pieces in a salt pickle for ten or twelve days, then steep in cold water for an hour. Allow to drip, and then roll up tightly, keeping the fat side outermost. Bind up each piece with strong cord, and roll each in a clean cloth, fastening the ends securely, and binding all up with twine. Boil gently for three or four hours, and press tightly between two boards.

Ham Rolling.—see Bacon and Ham Rolling.

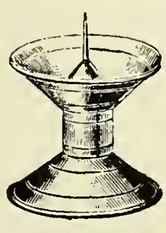
Ham Skins.—Are usually boiled up into a jelly for brawn, pork pies, etc. Some simply put them into the digestor and extract the gelatine, which may then be dried into glue.

Hams (Smokeless).—The ham is cut from the pig while yet warm, and $1\frac{1}{2}$ lbs. salt previously heated in an earthen vessel is entirely rubbed into it. A leather mitten may be worn as the salt must be rubbed in while very hot. The hams are then hung in the open air from three to four weeks, and can be eaten without being smoked.

Ham Stands.—Portable pedestals for showing hams in the shop windows or on the counter. They are also used for holding the ham for slicing, and are made in different styles; the most attractive being in china. Tin stands are also very common, and are made with or without a spike for fixing the ham.

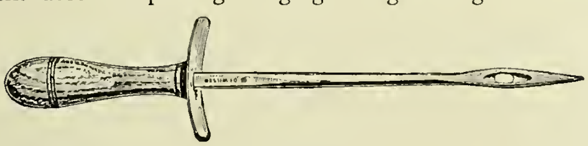


China Ham Stand.



Tin Ham Stand with Spike.

Ham Stringer.—A sharp pointed needle-like instrument used for passing hanging string through the shank end of hams. The same instument is used for passing cord through the wicker work of baskets, much like a packing needle.



Ham Stringer.

Hams to Boil.—(Cook's Recipé).—Soak the ham in cold water from six to twelve hours; place it in a kettle and cover it with cold water; bring it very slowly to a boil; remove the scum, and simmer it softly, allowing about 4 lbs. to the hour, until the skin can easily be removed. After taking off the skin replace the ham in the liquor, and leave it there until it has become cold, then rasp it in the usual way. If the ham be not probed or cut it will retain all its juices and be very mellow.

Hams to Corn.—see Corned Hams.

Hams to Cure.—see Curing Hams.

Hams to Ornament.—A German method.—Take a newly smoked ham, trim it, and remove the bones. Then take a knife and cut out in the rind, as if drawing right round the ham at an equal distance from the edge, all round a border of alternating squares like a chess-board, and fill up with grease (lard). Then take some red and white jelly, and put it on each of the squares turn about, and mark out a face on the ham with the two jellies. Then ornament here and there with lard, and red and white jelly here and there between the face and the border, and ornament round the dish with laurel leaves and lemon. Put on a frill at the leg piece.

Ham, Chicken, and Tongue Sausage.—

10 lbs. pork.
4 ,, veal.
2 ,, ox-tongue.
4 ,, fat.
4 ,, granulated rice, scalded.
2 ,, sausage meal.
2 ozs. food preservative (dry antiseptic).
12 ,, seasoning (as below).

The meat from a chicken and six eggs may be added.

A stock of seasoning may be made from following table—

9 lbs. salt.
6 ,, ground white pepper.
$\frac{1}{2}$,, ground mace.
$\frac{1}{2}$,, ground parsley.
$\frac{1}{4}$,, thyme.

Cut the pork, veal, and ox-tongue into pieces of about two inches square. Mix in the scalded rice and put the mixture through meat cutting machine. Add slowly the sausage meal, and then the other ingredients. Mince all very fine and fill into weasands. Boil for an hour at 200° Fahr., and dye with either poloney dye or ham, chicken, and tongue dye. Either of these is used in the same way as in the dyeing of poloneys.

The ox-tongues used are those imported from the United States. Chicken is a mere name, and is rarely added to the mixture owing to its costliness. Some makers add a small quantity of chicken in order to be truthful, but the quantity is quite inappreciable in the sausages.

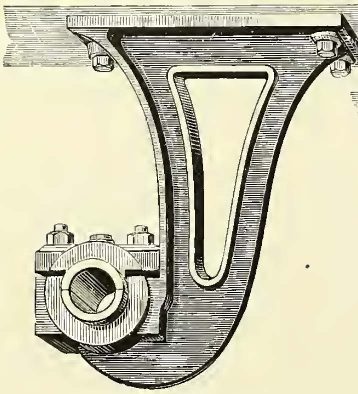
Ham, Tongue, and Chicken Sausage Dye.—Use

2 parts poloney dye (No. 2).
1 ,, bismarck brown.
$\frac{1}{10}$,, majenta (crystal roseine).

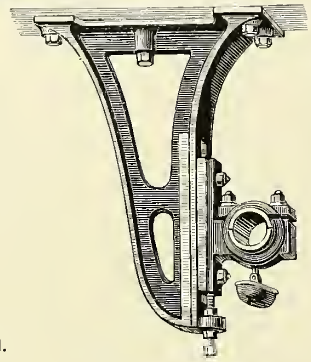
Boil and use when boiling. When the solution is boiling it distends the fat inside of skin and makes it firm and tight.

Ham Trier.—see Bacon Trier.

Hangers.—Wherever bars or lines of shafting require to be carried along a ceiling or suspended from joists or girders, hangers become a necessity. The usual shape is the **J** pattern which may be made adjustable, so that



J Hanger
with Plummer Block attached.



Ajustable Hanger
with Plummer Block attached.

inequalities in the carrying joists or timbers may be easily overcome by simply raising or lowering the adjustable plummer block.

Head Cheese.—*Recipé No. 1.*—Pig's heads, cheeks, rind, etc., are used. To from 10 to 12 lbs. of cheek, rind or heads, having three-fourths of an inch of fat, add two shanks thoroughly cooked, cut into pieces about one inch square, adding seasoning to suit. A little finely scraped lemon peel will greatly add to the flavour. Fill into beef bungs or stomachs, and boil three-quarters of an hour. To give the flat appearance, place a fifty pound weight upon the head cheese, placing it between two flat surfaces. Head cheese is sometimes smoked, but more usually not.

Recipé No. 2.—Take one head that has been in brine for two weeks, with one head fresh; add one heart, one brisket, one lamb or mutton head if you wish. Boil until the bones come off easily. Then chop moderately fine, add pepper and salt for seasoning. Stuff in bungs or muslin bags as full as you can with the hands; tie ends; lay on board and press with light pressure.

Recipé No. 3.—The head of the hog, the rind of the sides on which the fat has been left half-an-inch thick, and neck pieces are usually made into head cheese. Cook thoroughly and cut into strips of from one to one and-a-half inches in length, mix with it $5\frac{1}{4}$ ozs. salt, 2 ozs. ground pepper, $1\frac{1}{4}$ ozs. whole caraway seed, and if intended for immediate use, the grated rind of one lemon. The whole is to be well mixed. Stuff in hog's stomach or bladder. Cook from half to three-quarters of an hour. Remove and place between two flat boards, on the top of which place a fifty pound weight. This will give them the flat appearance wanted; remove the weight after twenty-four hours. Head cheese may also be smoked, but if left to be smoked four or five days they become hard.

Recipé No. 4.—Take 28 lbs. of side and 28 lbs. of fat and lean neck meat from a hog, 28 lbs. pickled veal cut from the leg, 12 pickled calves' or hogs' tongues, all of which is to be cooked, and cut into strips and mixed with 10 lbs of lean and 6 lbs. of chopped pork, 20 slices of eschallot, which has previously been fried in butter, 18 ozs. salt, 9 ozs. ground pepper, 1 ground lemon peel. Stuff in hog's bladders, boil one hour and treat as in head cheese No. 1.

Heads.—see Pig's Heads.

Herbs.—see Culinary Herbs.

Hickory Skewers.—Skewers are made from different kinds of timber, but dark hickory makes the most satisfactory article. They are manufactured in the Western States of America where the hickory trees are most plentiful, and the custom is to keep the sawmills moving on at regular periods, so as to save carriage on the rough timber. Skewers are made throughout by machinery; the cutting into lengths, turning, pointing, polishing, and tying into bundles being done in successive operations. In recent years a large admixture of white hickory has been made into skewers, but this timber is not so tough as the darker variety, and although the admixture can only be looked on as adulteration, it is an adulteration which seemingly must be tolerated, as it is impossible to buy skewers from the ordinary sources without having to take a considerable proportion of white hickory in the bundles. The sizes of skewers and average packing per barrel are as follows:—

Size.			Average Number in Barrel.
No.	Length.	Diameter.	
1	$4\frac{1}{2}$ inches	$\frac{5}{32}$ inches	68,000
2	5 ,,	$\frac{7}{32}$,,	35,000
$2\frac{1}{2}$	$5\frac{1}{2}$,,	$\frac{7}{32}$,,	34,000
3	6 ,,	$\frac{7}{32}$,,	31,000
4	6 ,,	$\frac{4}{16}$,,	21,000
5	$5\frac{1}{2}$,,	$\frac{4}{16}$,,	23,000
6	7 ,,	$\frac{4}{16}$,,	17,000
7	8 ,,	$\frac{4}{16}$,,	15,000
$7\frac{1}{2}$	9 ,,	$\frac{4}{16}$,,	12,000
8	7 ,,	$\frac{5}{16}$,,	12,000
9	8 ,,	$\frac{5}{16}$,,	10,500
10	9 ,,	$\frac{6}{16}$,,	9,000
11	10 ,,	$\frac{6}{16}$,,	8,000
12	7 ,,	$\frac{9}{32}$,,	15,000
13	12 ,,	$\frac{6}{16}$,,	5,000
14	14 ,,	$\frac{6}{16}$,,	4,500
15	16 ,,	$\frac{6}{16}$,,	3,500
16	8 ,,	$\frac{9}{32}$,,	11,000

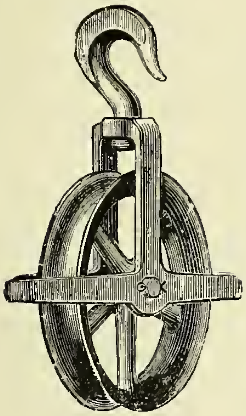
Hog Casings.—see Pig Casings.

Hog Catcher.—see Pig Catcher.

Hog Puddings.—see Cornish Hog Puddings.

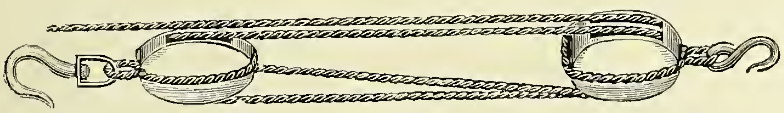
Hog's Head, Filled.—see Filled Hog's Head.

Hoists.—A hoist is an apparatus for lifting weights from a lower level to a higher one, and it can also be used conversely for lowering a weight from a higher level to a lower one.

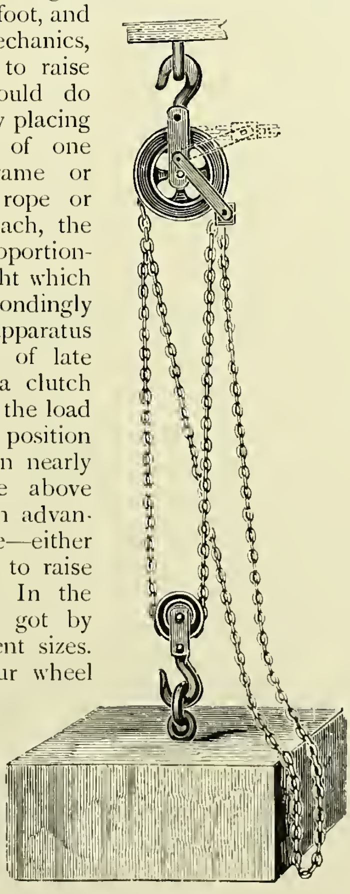


Gin Block.

The simplest kind of hoist is the gin block consisting of a hook attached to an eyebolt above the highest level to which the weight is to be elevated. To the hook is attached a frame in which works a grooved pulley. Over this pulley is run a rope or a chain with a hook or other means of attachment spliced to the end of it. It is obvious that if the other end of the rope is pulled with sufficient force, the load will be lifted as the pulley revolves. When two pulleys and hooks of the above sort are connected together as in the ordinary pully block, the principal of the lever comes into operation. The chain or rope is fixed to the frame of upper pulley block, then passes round the lower pully, then over the top pulley.



It is obvious that by this arrangement for every foot the hand chain is pulled, the weight attached to the lower pulley block will rise half a foot, and according to the laws of mechanics, the operator will be able to raise double the weight he could do with the single pulley. By placing several pulleys alongside of one another in the same frame or sheave, and passing the rope or chain successively round each, the speed of lifting will be proportionately reduced, and the weight which may be lifted correspondingly increased. This form of apparatus has been much improved of late years by the addition of a clutch arrangement, which enables the load to be suspended in any position without slipping down. In nearly all hoisting machines the above principle of leverage is taken advantage of, so that a small force—either manual or power—suffices to raise a relatively heavy load. In the crab winch this effect is got by using spur wheels of different sizes. It is obvious that if a spur wheel with say twenty teeth is geared to a spur wheel with forty teeth, that two revolutions will be required to bring about one revolution of the latter. If the handle of such an apparatus is attached to the smaller wheel, and the barrel on which the rope is coiled is attached to the larger wheel, then two revolutions of the handle are required to make one revolution of the barrel, and the operator turning the handle will be able to raise double the load he would be able to do if the handle were attached directly to the barrel. If the smaller wheel has ten teeth and the larger one thirty teeth, he will be able to raise three times the load, and so on.

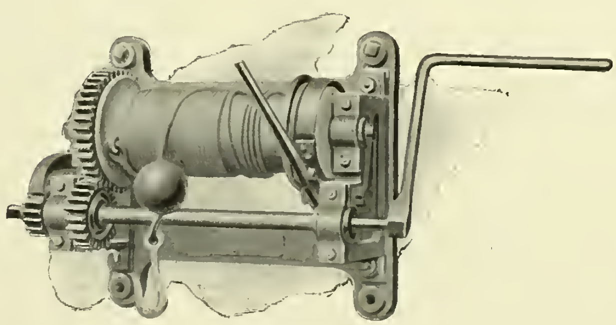


Weston Pulley Block with self sustaining Clutch.

To work the crab winch it is necessary to carry the rope over a gin block fixed above the height to which the load has to be raised.

For slaughter-houses and bacon factories the wall hoist, which is a crab winch without the cumbersome frame, is commonly used. For small loads, such as pigs or sheep, this hoist is used in conjunction with the simple gin block; for raising cattle it is necessary to have a two block tackle attached.

Larger hoists in great variety are made for many purposes, but in all of these the principal is the same, they are mechanical contrivances by which a small power elevates a relatively large load. Instead of a larger and smaller spur wheel, it is usual to have a worm and spur wheel arrangement in hoists dealing with heavy loads, as the worm wheel arrangement is much safer. Such hoists may be operated by hand with a **V** wheel and hand rope or by power with one fast pulley and two slack ones, with an open belt and a crossed one, and striking gear whereby the belts can be placed alternatively on the fast pulley; the one belt driving the hoist for elevating and the other in the opposite direction for lowering.

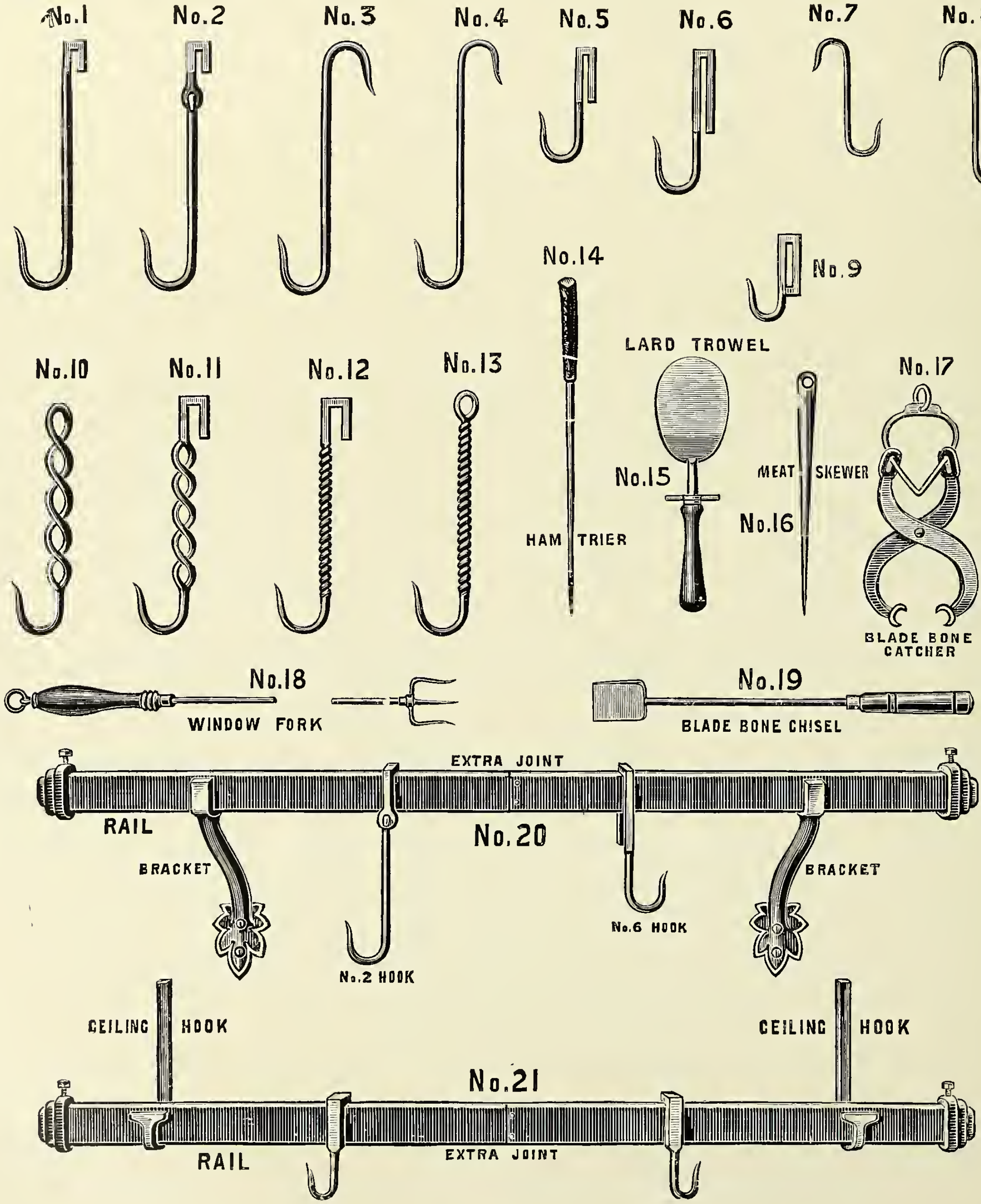


Wall Hoist.

Electric motors and hydraulic power have been applied with great success to heavy elevators. The passenger and goods elevators, which are now so common, consist of cages working in vertical slides and attached to hoists of the above description. For a great many manufacturing purposes the bucket elevator is made use of: it consists of a belt or two chains working over suitable top and bottom pulleys; to the belt or chains, sheet iron or steel buckets are attached at convenient intervals. The material to be elevated is shovelled or propelled into the buckets at the bottom, and is carried up by them to the top and discharged on a suitable landing place. A modification of this apparatus is used by some of the larger meat companies for hoisting carcases of frozen mutton from lighters to their storage depôts. Another form of hoist much used for the elevation of grain is constructed on the principle of the archimedian screw.

Hooks, etc.—The various hooks and other odds and ends figured on this page, are used for shop purposes mainly, and as often as not are plated. The designs are artistic and neat—more especially the twisted stems which look very pretty. Most French meat purveyors use these hooks. The Nos. 10, 11, 12, and 13 are specially ornamental in design.

Fig. 14 is a ham trier; 15 is a lard trowel, which made of plated metal is a handy tool in a shop; 16 is a meat skewer, and if plated, looks well in a round of beef or in cooked



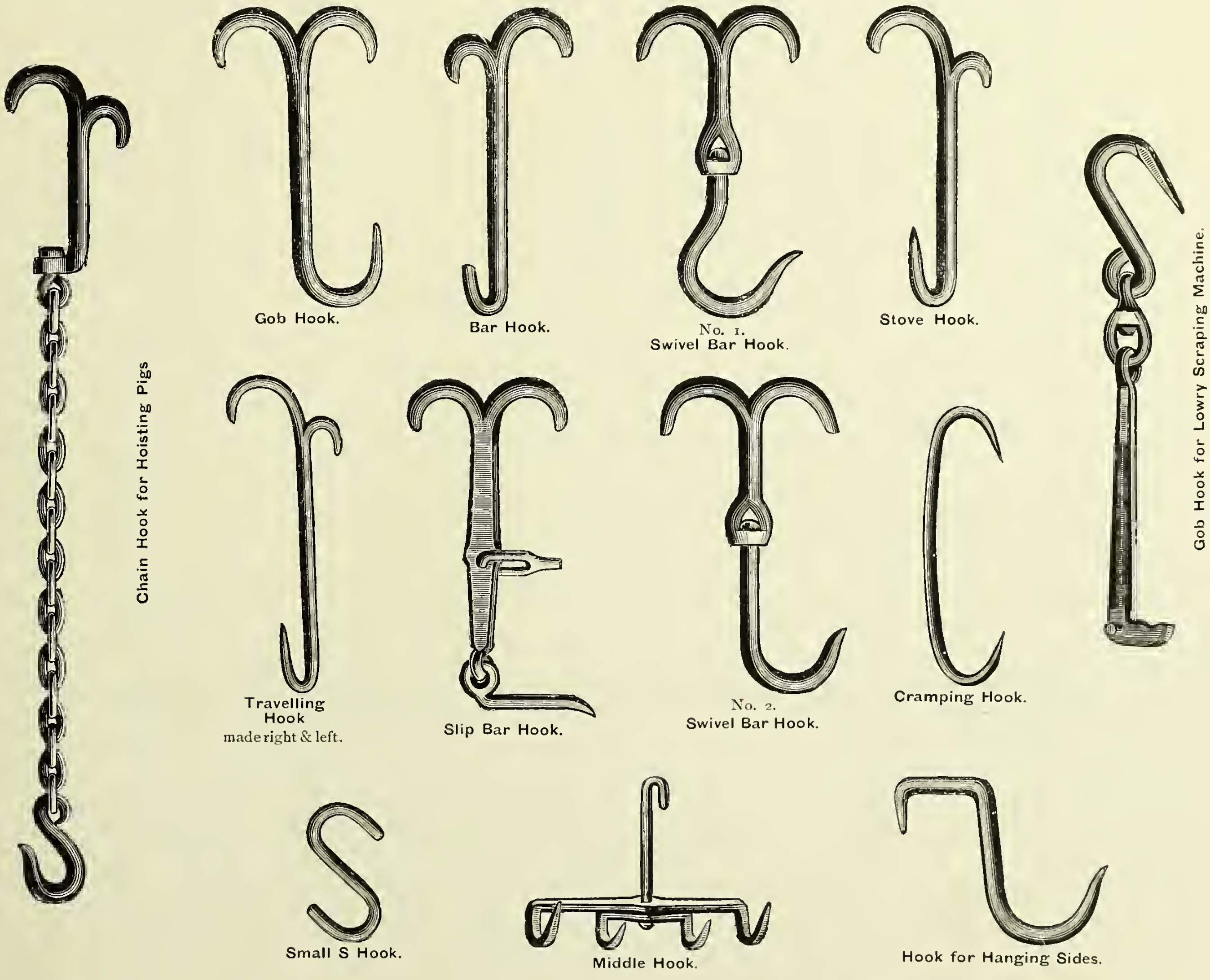
Specimens of Hooks, Bars, and Sundry Tools, usually made of plated metal, for use in shops.

styles, and as they devote much attention to the ornate in their shops, they are worth following in a matter of this sort. Nos. 1, 2, 3, and 4 are long hooks; Nos. 5, 6, and 9 are hooks for rectangular bars; and Nos. 7 and 8 are small **S** briskets of beef; 17 is a blade bone catcher; 18 is a window fork, the use of which is obvious; it serves to pick up small goods which may be out of reach in a window; 19 is a blade bone chisel; 20 and 21 show the kind of bars for

shops made of plated material. Any kind of hook suits these bars, but perhaps the most appropriate is the one which fits exactly the rectangular shape. These bars show greatly to advantage where the shop is white tiled.

Bar Hooks.—In every factory or shop a supply of bar hooks is essential for the conduct of this business. These hooks take various forms as the accompanying illustrations show. Thus, when pig slaughtering is carried out the first hook used is the "chain hook," which is used to shackle

The third hook is the "travelling hook." This one is inserted into the sinews of the hind legs of the pig, and is generally made right and left, so that a separate hook can be put into the two legs of one pig. When the pigs are split down these hooks serve for suspending the sides. The small lugs are for raising the pigs off the track bar, at the weighing machine. Other hooks used for special purposes are "swivel bar hooks," "cramping hooks," "stove hooks"—for hanging sides of bacon, etc., when being smoked in smoke stoves, "middle hooks," and small "S hooks."



round one of the hind legs of the pig. When shackled the small lug is caught up by the hook or ring of windlass, and the pig hoisted. The large lug is dropped on to the track bar overhead, and the pig instantly slaughtered.

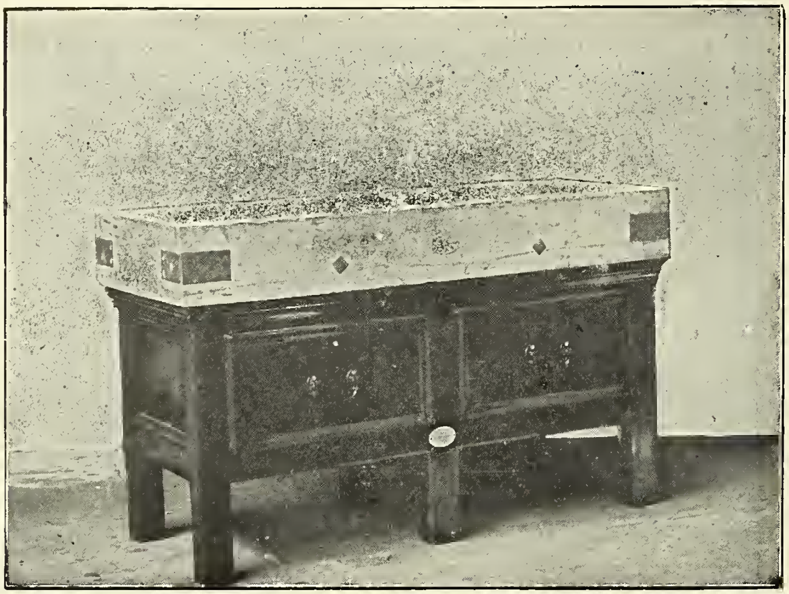
The second hook used is the "gob hook." This hook is inserted into the apex of the lower jaw of the pig after it has been scalded and scraped, and one of the lugs of the hook is dropped on to the track bar which travels beneath the singeing stack. By the other lug the hook at end of chain in furnace is attached, and the pig raised and lowered inside the stack.

Hornbeam Blocks.—These popular blocks are made mostly in France from the hornbeam wood which grows on the heights of the Pyrenees and elsewhere. The trees grow so slowly that the wood is exceptionally hard, and can stand any amount of chopping. Segments are cut from the centre of the tree, and placed diagonally together and clamped, then screwed into a longitudinal block.

Horses in Natal.—see Natal.

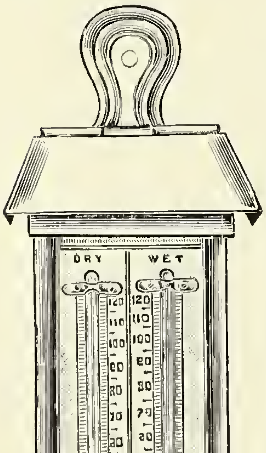
Horses in South Australia.—see South Australia.

Horses in Western Australia.—see Western Australia



Hornbeam Block.

Husk Meal.—Is the ground shellings of oats or rice. It has been found that these shellings when ground into a powder do not readily ferment. For this reason they have been used extensively for drying up the free moisture which generally lingers in the pocket-holes of sides of bacon. The husk meal is mixed with equal quantities of dry antiseptic and dusted into the pocket-holes. Souring is thereby altogether avoided.



Hygrometer.

Hygrometer—The hygrometer is an instrument for measuring the humidity of the air. It consists of two thermometers placed in a common frame. One of these called the "dry bulb" thermometer is exposed throughout to the atmosphere, the other called the "wet bulb" thermometer has the bulb encased in wet cotton cloth, which is maintained wet by a sort of wick of cotton thread, which dips into a small vessel containing rain water, and by capillary attraction carries up a supply of moisture to the cloth surrounding the thermometer bulb, sufficient to maintain it constantly saturated. Under these conditions moisture evaporates from the surface of the cotton cloth at a rate exactly proportional to the humidity of the surrounding atmosphere, and as moisture in evaporating absorbs and renders latent (or insensible to the thermometer), a definite amount of heat, it follows that the wet bulb thermometer shows a reading lower than the other one, and this difference is exactly proportioned in inverse ratio to the amount of moisture in the atmosphere. The table worked out by Glaisher gives the percentage of humidity for different temperatures.—see next page

The hygrometer is of great value in determining the amount of moisture in bacon curing cellars and cold rooms. The proper regulation of the humidity is frequently only second in importance to the regulation of the temperature for the treatment and storage of different classes of provisions, etc.

ICE Association of the United Kingdom.—An association formed in 1899 with the following classification of membership:—

Members.—All persons having a real connexion with the manufacture of ice-making and refrigerating machinery, of refrigerators and ice safes, and of all accessories; keepers of cold stores for the use of the public; ice importers and wholesale ice merchants, those intimately associated with the allied industries, and all those qualified for membership of such organisations as the Institution of Mechanical Engineers, and the like.

Associates.—All persons having a real connexion with the trade who, in the opinion of the executive council, are not eligible as members.

Honorary Members.—All persons of eminent scientific acquirements of any nationality, public servants of the Crown, and any persons prominently connected with the refrigerating industry, the cold storage business, or the ice trade in foreign lands, and who are approved by the council.

The annual subscription is payable in advance on or before the 25th day of March in each year. The subscription is one guinea for full members, and half a guinea for associates. When a certain stage has been reached in the membership—to be fixed at the discretion of the executive council—an entrance fee may be imposed on all new members.

The first office-bearers were elected in January 1900, under the presidentship of the Hon. Alan de Tatton Egerton, M.P., who still occupies the position. The other office-bearers of the association are:—

Vice-Presidents.

Mr B. Godfrey.	Mr T. B. Lightfoot.
Sir A. S. Haslam, M.P.	Mr L. Sterne.

Executive Council.

Mr J. Wemyss Anderson.	Mr P. F. Kensett.
Mr W. D. A. Bost.	Mr W. H. Key.
Mr C. Brock.	Mr A. Marcet.
Mr M. T. Brown.	Mr J. Lorne MacLeod.
Mr G. Halliday.	Mr S. Puplett.
Mr M. Hinchliff.	Mr Hal Williams.

Hon. Treasurer.

Mr J. G. Lorrain, Norfolk House, Norfolk Street, London, W.C.

Hon. Auditors.

Mr P. Gaskell, 11 Carr Lane, Hull.
Mr V. W. Yorke, Farringdon Works.

Hon. Solicitors.

Mr E. A. Bell (Carter & Bell), 6 Idol Lane, Eastcheap, London, E.C.
Messrs Wigham & MacLeod, 23 Albany Street, Edinburgh. N.B.

Bankers.

The National Bank, Ltd. (Strand Branch),
180 Strand, London, W.C.

Hon. Secretary.

Mr R. W. Leonard, 19 Ludgate Hill, London, E.C.

Table showing Degrees of Humidity as Indicated by the Hygrometer.

Fahrenheit Scale from 35° to 55°.

The point of saturation is taken as equal to 100.

Reading of Thermometer.		Degree of Humidity.
Dry bulb	Wet bulb	Saturation = 100.
35	35·0	100
	34·	98
	34.6	96
	34·4	94
	34·2	92
	34·0	90
	33·8	88
	33·6	86
	33·4	84
	33·2	82
	33·0	80
	32·8	79
	32·6	77
	32·4	75
	32·2	74
	32·0	72
36	36	100
	35	91
	34	82
	33	74
	32	66
	31	59
	30	53
	29	47
	28	42
37	37	100
	36	91
	35	83
	34	75
	33	68
	32	61
	31	55
	30	49
	29	44
	28	39
38	38	100
	37	91
	36	83
	35	75
	34	68
	33	62
	32	56
	31	50
	30	45
	29	41
	28	37
39	39	100
	38	92
	37	84
	36	77
	35	70
	34	63
	33	57
	32	52
	31	47
	30	42
	29	38
	28	34
40	40	100
	39	92
	38	84
	37	76
	36	69
	35	63
	34	57
	33	51
	32	46
	31	42
	30	38
	29	34
	28	31
41	41	100
	40	92
	39	84
	38	77
	37	70
	36	64

Reading of Thermometer.		Degree of Humidity.
Dry bulb	Wet bulb	Saturation = 100.
41	35	58
	34	53
	33	48
	32	43
	31	39
	30	35
	29	31
	28	28
42	42	100
	41	92
	40	85
	39	78
	38	72
	37	66
	36	60
	35	54
	34	49
	33	44
	32	40
	31	36
	30	33
	29	30
	28	27
43	43	100
	42	92
	41	84
	40	78
	39	71
	38	65
	37	59
	36	54
	35	49
	34	45
	33	41
	32	37
	31	34
	30	31
	29	28
44	44	100
	43	92
	42	84
	41	77
	40	71
	39	65
	38	59
	37	54
	36	49
	35	45
	34	41
	33	37
	32	34
	31	31
	30	28
45	45	100
	44	92
	43	85
	42	78
	41	72
	40	66
	39	60
	38	55
	37	50
	36	46
	35	42
	34	38
	33	34
	32	31
	31	28
46	46	100
	45	93
	44	86
	43	79
	42	73
	41	67
	40	61
	39	56
	38	51
	37	47

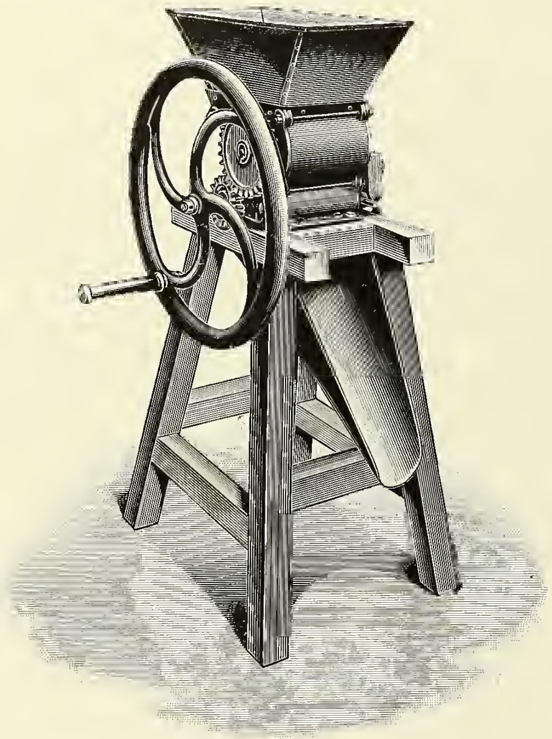
Reading of Thermometer.		Degree of Humidity.
Dry bulb	Wet bulb.	Saturation = 100.
46	36	43
	35	39
	34	35
	33	32
	32	29
47	47	100
	46	93
	45	86
	44	79
	43	73
	42	67
	41	61
	40	56
	39	51
	38	47
	37	43
	36	39
	35	36
	34	33
	33	30
48	48	100
	47	93
	46	86
	45	79
	44	73
	43	67
	42	62
	41	57
	40	52
	39	48
	38	44
	37	40
	36	36
	35	33
	34	30
49	49	100
	48	93
	47	86
	46	79
	45	73
	44	67
	43	62
	42	57
	41	53
	40	49
	39	45
	38	41
	37	37
	36	34
	35	31
	34	28
50	50	100
	49	93
	48	86
	47	80
	46	74
	45	68
	44	63
	43	58
	42	53
	41	49
	40	45
	39	41
	38	37
	37	34
	36	31
	35	29
	34	27
51	51	100
	50	93
	49	86
	48	80
	47	74
	46	68
	45	63
	44	58
	43	54
	42	50

Reading of Thermometer.		Degree of Humidity.
Dry bulb	Wet bulb	Saturation = 100.
51	41	46
	40	42
	39	38
	38	35
	37	32
	36	29
	35	27
	34	25
52	52	100
	51	93
	50	86
	49	80
	48	74
	47	69
	46	64
	45	59
	44	54
	43	50
	42	46
	41	42
	40	39
	39	36
	38	33
	37	30
	36	27
	35	25
53	53	100
	52	93
	51	86
	50	80
	49	74
	48	69
	47	64
	46	59
	45	55
	44	51
	43	47
	42	43
	41	39
	40	36
	39	33
	38	30
	37	28
	36	25
54	54	100
	53	93
	52	86
	51	80
	50	74
	49	69
	48	64
	47	59
	46	55
	45	51
	44	47
	43	43
	42	40
	41	37
	40	34
	39	31
	38	28
	37	26
55	55	100
	54	93
	53	87
	52	81
	51	75
	50	70
	49	65
	48	60
	47	56
	46	52
	45	48
	44	44
	43	41
	42	38
	41	35
	40	32
	39	29
	38	27

Ice Boxes.—see Cold Chambers.

Ice Breaker.—A machine for breaking blocks of ice into various sizes for packing small refrigerating cabinets, fish boxes, etc. It may either be fitted for hand or power, and can be made of any capacity.

The principle on which it works is that of a shute leading to two revolving drums fitted with curved spikes. The block is placed in the shute and the drums revolved, when the block is broken in small pieces which fall out below

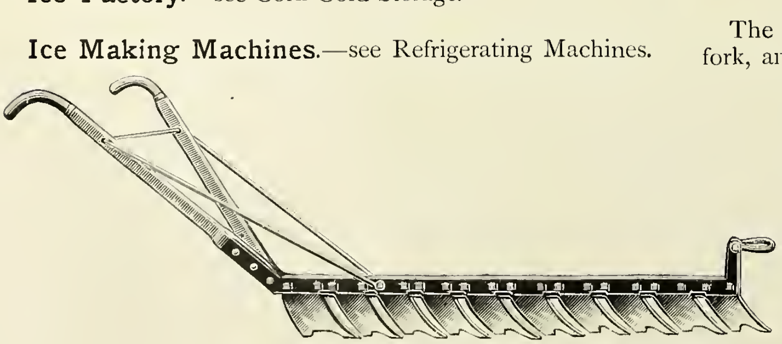


Ice Breaking Machine.

into a receptacle placed for the purpose. It will readily be understood that from the much greater surface exposed, small pieces of ice give a better refrigerating effect than large pieces; but for ordinary use it is wasteful, as the consumption is much more rapid. However, whether in blocks or in small pieces the most economical way is never to allow any space in the ice crate, for in proportion to the quantity of ice present is the measure of wastefulness or otherwise.

Ice Factory.—see Cork Cold Storage.

Ice Making Machines.—see Refrigerating Machines.



Snow Plough.

Ice Tools.—In the United Kingdom tools for manipulating ice have not a wide range, but in the United States the variety is very great. Ice harvesting in the U.S.A. is an important industry, and ploughs, markers, planes, corrugating knives, splitting knives, forks and bars, breaking bars, bar chisels, grapples, saws, elevator forks, augers, canting hooks, tongs, axes, shavers, and a whole lot of other appliances are required for the operations. For the manufacture of ice tools special iron and steel is required as the tear and wear is very heavy; the ice harvest is crowded into a short season; the men are hurried in consequence; the weather is cold, and any delay caused by defective tools may mean a big loss.

The snow plough was invented about seventy years ago, and the original ploughs were very clumsy apparatus. Wooden logs were bound together with a row of iron teeth inserted longitudinally, but improvements followed quickly. Iron beams were substituted for wooden, and the teeth were made with flanges: then the teeth were hollowed so as to reduce sharpening, and steel took the place of iron in the manufacture of the teeth.

The old fashioned method of harvesting ice was by means of the saw and pick axe, and it required no stretch of the imagination to think out the difference from such slow methods to the plough system with horse traction.

Splitting Fork.

Splitting forks are used for "wegging" the plough grooves. It is essential that they should be of good steel, and sufficiently tapered to prevent "shelling" of the ice. They should also be heavy enough to break off large sheets of ice from the ice-fields when necessary.

Bar Chisel.

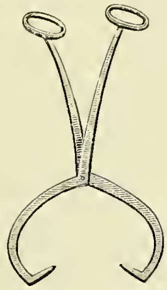
The bar chisel is made with a wide blade, bevelled on one side, and is used mostly to cut round the cakes in getting ice out of the store house. It is also used for trimming off any uneveness of the blocks when stowing ice in the store, and for breaking out the canal or cutting holes.

Splitting Chisel.

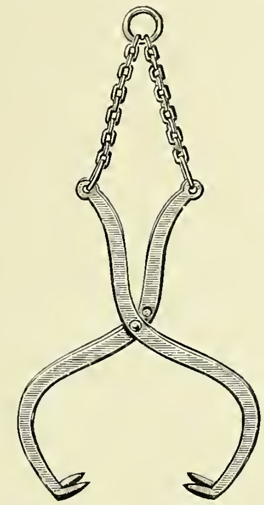
The splitting chisel is a lighter tool than the splitting fork, and is used when grooves become frozen, or are of insufficient depth.

Stowing tongs are used for handling ice when storing, and are made with long handles so as to allow the user to effectually handle the blocks from a convenient position.

Hoisting tongs are used for lifting large blocks by means of a crane or other hoisting gear, or for lowering into the holds of vessels, and are in consequence made of extra strength to stand rough usage.



Stowing Tongs.



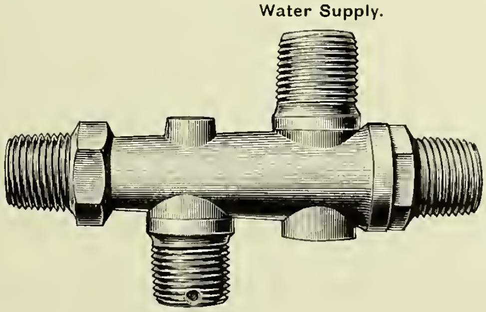
Hoisting Tongs.

Incubator Thermometer.—see Thermometers.

Independent Jacketed Pans.—see Boiling Pans.

Injector.—It is not often that the head of water in service pipes is high enough to allow it to be run directly into a high pressure boiler against the head of steam, besides the the water companies as a rule object to having service pipes connected directly, even to low pressure boilers. Then in many cases the water to supply the boilers is not under pressure at all, but must be taken from cisterns or wells. So that obviously some apparatus is required to force the water supply into the boiler when working. For this purpose either a pump or an injector is required. The pump is relatively dear and gives some trouble in working, especially after it is worn. The injector is a small compact and cheap apparatus, and with ordinary care works well and gives no trouble. The injector works in the following way:—A supply of steam from the boiler is connected to a cone in the top of the injector. This cone projects into the water supply chamber and is opposite another cone in which the water and steam are mixed, and acquire sufficient velocity to carry the water into the boiler.

The following illustration shows a section of a self-acting re-starting injector minus the cocks and connections.



Inspection of Meat in United States.—Dr D. E. Salmon, the chief of the Bureau of Animal Industry, reports as follows for the year ending 30th June 1900:—

Meat Inspection.—The inspection of meat for the inter-state and foreign trade has been conducted during the year on the same principles as heretofore. There has been a great reduction in the amount of microscopic inspection on account of the lessened demand in continental Europe for American pork. This is probably due to the higher price which this article has commanded in the American market.

The expense of microscopic inspection is considerably greater per carcase examined than heretofore, partly because of the irregularity of this work and partly because more time has been given to each specimen examined.

In the general meat inspection much time has been devoted to improving the system and perfecting checks to guard against the use by unscrupulous dealers of meat which has been condemned as unwholesome. The law, which is intended to guard against this fraud, is not as stringent or as perfect as is desirable, and it requires constant vigilance on the part of the inspectors to accomplish the object of the inspection.

The number of localities where the work of meat inspection was in operation during the year was increased from 41 to 45, while the number of abattoirs and packing houses receiving the benefit of this inspection was 148, as against 138 in the preceeding year.

The table given below shows the numbers and different kinds of animals inspected before slaughter in stock yards and at abattoirs. As most of the animals are inspected in the stock yards, comparatively few are rejected at the abattoirs. The figures show a material increase in all classes of animals inspected with the exception of hogs, of which the number is noticeably diminished:—

Ante-mortem Inspection for the Fiscal Year 1900.

Kind of Animal.	For Official Abattoirs in Cities where Inspections were made.	For Abattoirs in other Cities and miscellaneous Buyers.	Total Inspections.	Rejected (subject to result of post-mortem Inspection)	
				At abattoirs.	In Stock Yards.
Cattle - -	5,027,998	4,628,764	9,656,762	214	31,752
Sheep - -	6,170,172	3,684,560	9,854,732	776	10,725
Calves -	308,542	251,193	559,735	265	3,095
Hogs - -	23,328,102	9,683,103	33,011,205	4,637	107,989
Horses -	5,560	...	5,560	66	...
Total -	34,840,374	18,247,620	53,087,994	5,958	153,561

The following table, showing the total number of animals inspected before slaughter for abattoirs having inspection, for the fiscal years 1891 to 1900, is given for the purpose of comparison:—

Number of Animals Inspected before Slaughter for Abattoirs having Inspection, Fiscal Years 1891 to 1900.

Fiscal year	Cattle.	Calves.	Sheep.	Hogs.	Horses.	Total.
1891 -	83,891	...	...	...	...	83,891
1892 -	3,167,009	59,089	583,361	..	...	3,809,459
1893 -	3,922,174	92,947	870,512	...	...	4,885,633
1894 -	3,862,111	96,331	1,020,764	7,964,850	...	12,944,056
1895 -	3,752,111	109,941	1,344,031	13,576,917	...	18,783,000
1896 -	4,050,011	213,575	4,710,190	14,301,963	...	23,275,739
1897 -	4,289,058	259,930	5,179,643	16,813,181	...	26,541,812
1898 -	4,552,919	241,092	5,706,092	20,713,863	...	31,213,966
1899 -	4,654,842	245,859	5,718,464	23,783,576	3,232	34,405,973
1900 -	5,027,998	308,542	6,170,172	23,328,102	5,560	34,840,374

The numbers and classes of animals inspected at time of slaughter and the number of these or parts thereof condemned will be found in the following table:—

Post-mortem Inspection for Fiscal Year 1900.

Kind of Animal.	Number of Inspections.			Carcases condemned.			Parts of Carcases condemned at Abattoirs.
	For Official Abattoirs.	On Animals rejected in Stock Yards.	Total.	For Official Abattoirs.	Animals rejected in Stock Yards.	Total.	
Cattle -	4,841,166	20,828	4,861,994	6,209	4,029	10,238	8,973
Sheep -	6,119,886	5,209	6,125,095	4,234	1,240	5,474	309
Calves -	315,693	276	315,969	182	54	236	32
Hogs -	23,336,884	92,112	23,428,996	38,598	7,248	45,846	21,032
Horses -	5,559	...	5,559	112	...	112	...
Total -	34,619,188	118,425	34,737,613	49,335	12,571	61,906	30,346

The above table shows the condemnations made upon ordinary inspection; the additional number resulting from the microscopic inspection of hogs for trichinæ will be referred to under another heading.

Besides the carcases condemned at slaughter or for trichinosis, a large number, as usual, were tanked because of death resulting from disease or injury, or because the animals had been killed by city inspectors after rejection in the stock yards, or had been found dead in cars or pens at abattoirs. The subjoined table shows the numbers so disposed of:—

Manner of Death.	Cattle.	Sheep.	Calves.	Hogs.	Horses.	Total.
Died in stock yards	383	974	160	1,854	...	3,371
Killed in stock yards	1,691	1,827	574	6,036	...	10,128
Died at abattoirs -	250	1,118	119	15,426	29	16,942
Total - -	2,324	3,919	853	23,319	29	30,441

On the top of the next page is a statement of the total number of carcases and parts condemned and tanked, including the animals found dead and those killed by the city inspectors, and giving the causes of condemnation at time of slaughter.

The meat inspection tag or brand was placed upon 17,177,442 quarters, 343,427 pieces, 1554 sacks of beef, 6,050,444 carcases of sheep, 310,126 carcases of calves, 1,138,507 carcases of hogs, and 653,756 sacks and 48,485 pieces of pork.

The number of packages to which the ordinary meat inspection stamp was affixed consisted of 5,584,995 containing beef, 24,151 of mutton, 107 of veal, 13,122,677 of pork, and 602 of horseflesh.

The number of cars that were sealed containing inspected products for trans-shipment to official establishments and other places, was 69,937.

The number of ordinary certificates issued, except for horseflesh, was 43,631. The meat products for export covered by these certificates comprised 1,766,234 quarters, 22,844 pieces, and 1,225,214 packages of beef, with a total weight of 438,138,233 pounds; 11,468 packages of mutton, weighing 680,897 pounds; and 46,233 carcases of hogs and 897,551 packages of pork, weighing 272,050,663 pounds. Eight certificates were issued for 472 packages of horseflesh, weighing 188,800 pounds.

The cost of conducting the work of ordinary meat inspection was $505,280·52; this is an increase of $39,571·29 over the amount expended the previous year, and as this year's total of ante-mortem inspections is 53,087,994, against 53,223,176 in 1899, the average cost of each inspection is increased from 0·88 cent. to 0·95 cent.

The following statement shows the cost of each ante-mortem inspection from 1893 to 1900 inclusive:—

	Cents.		Cents.
1893 - - -	4·75	1897 - - -	·91
1894 - - -	1·75	1898 - - -	·80
1895 - - -	1·10	1899 - - -	·88
1896 - - -	·95	1900 - - -	·95

Microscopic Inspection of Pork.—The number of carcases examined was 999,554, resulting in the following classification:—class A, free from all appearance of trichinæ, 968,405, or 96·88 per cent.; class B, containing trichina-like bodies or disintegrating trichinæ, 11,701, or 1·17 per cent.; class C, containing living trichinæ, 19,448, or 1·95 per cent. The percentages this year are practically the same as those previously found, there being a slight increase in carcases of class C.

There were 19,465 trichinous carcases (including a few left over from preceding year) disposed of; their weight is given as 4,674,363 pounds. Of this quantity, approximately, half was tanked, the rest being turned into cooked meat.

The number of certificates issued for packages bearing the microscopic inspection stamp was 12,107; the number of packages was 253,333, with a weight of 55,809,6[illegible]6 pounds.

The year having witnessed a great falling off in the trade in microscopically inspected pork products, the number of examinations and the number of pounds exported were reduced to about half the figures for 1899, while the expenses were reduced by about one-fourth, and, as a consequence, the relative cost is much more. The figures for this year are: expenditures, $154,950·22; average for each carcase examined, 15·5 cents.; for each pound exported, 0·277 cent. For 1899 the corresponding figures were $198,355·14; 8·9 cents.; 0·182 cent.

Inspection of Vessels and Export Animals.—While there has been an increase in the total exports of cattle to all countries for 1900 over 1899, the decline in the number of domestic cattle and sheep exported to Europe, noted in the last report, has continued, but there has been increase in the number of horses over last year of 40 per cent. The figures for Canadian shipments from American ports show a decrease in all classes of animals.

The table at foot of following page shows the number of American and Canadian animals inspected, number rejected for export, number tagged, and number exported during the fiscal year 1900:—

Cause of Condemnation of Carcases and Parts of Carcases for Fiscal Year 1900.

Cause of Condemnation.	Cattle.		Sheep.		Calves.		Hogs.		Horses.
	Carcases.	Parts.	Carcases.	Parts.	Carcases.	Parts.	Carcases.	Parts.	Carcases.
Actinomycosis	1,661	766	...	...	3	1	27	9	...
Tuberculosis	4,194	85	993	...	9	...	4,379	1,061	1
Cholera aud swine plague	...	...	...	...	...	...	32,859	...	...
Texas fever	49	...	...	...	13	...	...	...	...
Echinococcus	...	203	34	12	1	...	11	476	...
Measles	...	...	...	...	...	...	30	...	...
Scabies	...	...	51	...	...	...	103	...	...
Eczema	...	...	41	...	...	..	17	.	...
Erysipelas	...	...	...	...	...	..	29	...	...
Cancer	92	...	1	...	...	...	5	...	...
Tumor	21	337	7	. .	...	...	616	4,696	...
Abscess	107	3,735	351	51	8	4	804	2,427	1
Pneumonia	209	...	263	...	15	...	1,078	...	6
Pleurisy	30	...	83	...	2	...	67	26	1
Bronchitis	...	...	...	...	...	...	...	...	...
Carditis	3	...	1	...	...	...	...	..	1
Enteritis	31	2	86	...	10	...	325	..	1
Peritonitis	170	1	70	...	7	...	409	...	3
Metritis	20	...	8	...	...	...	134	...	1
Nephritis	3	...	74	...	...	...	74	...	...
Uræmia	5	...	.36	...	3	..	10	..	...
Mammitis	...	...	1	...	..	...	9	532	...
Septicæmia	233	...	284	...	8	...	828	...	12
Pyæmia	225	...	224	...	6	..	1,635	...	5
Gangrene	21	...	1	...	...	...	19	...	...
Anæmia, emaciation, marasmus	1,546	...	1,730	...	35	...	423	...	37
Ascites	14	...	76	...	...	...	47	...	...
Jaundice	161	675	212	...	6	...	782	...	...
Extreme temperature, various causes	4	...	36	...	4	...	202	..	2
Pregnancy	40	...	30	...	..	...	344	...	...
Recent parturition	17	...	5	...	...	...	60	...	2
Hernia	10	...	4	...	...	...	13	..	...
Downers, bruised, injured, etc. ...	1,366	3.169	756	246	33	27	507	11,805	29
Dead from various causes	633	...	2,092	...	279	...	17,280	...	29
Too young	...	...	1	...	70	...	...	...	...
Leucocythæmia	5	...	...	...	...	...	..	...	...
Gastritis	1	...	...	...	...	...	..	...	...
Anthrax	...	..	6	...	...	...	...	...	...
Encephalitis	...	...	1	..	...	...	...	..	...
Distoma	...	...	2	...	...	...	...	...	...
Œsophagostoma	...	...	6	...	...	...	...	...	..
Sick	...	...	...	...	3	...	...	...	...
Melanosis	...	...	...	...	...	...	...	...	1
Paraphimosis	...	...	...	...	...	...	..	...	1
Fistula	...	...	...	...	...	...	...	..	6
Open joint	...	...	...	...	...	...	...	...	2
Killed by city inspectors	1,691	...	1,827	...	574	...	6,036	...	...
Total	12,562	8.973	9,393	309	1,089	32	69,162	21,032	141

Number of Inspections, etc., of American and Canadian Animals, Fiscal Year 1900.

Kind of Animal.	American.				Canadian.		
	Number of Inspections.	Number Rejected.	Number Tagged.	Number Exported.	Number Inspected.	Number Rejected.	Number Exported.
Cattle -	632,512	1,373	318,298	*a*305,182	23,652	18	23,634
Sheep -	134,313	53	...	*b*73,426	28,954	64	28,890
Horses	54,868	173	...	*c*37,080	1,447	1	1,446
Swine -	...	...	...	10	...	...	...

a 9,754 via Canada. *b* 1,581 via Canada. *c* 410 via Canada.

The figures showing the exports of American and Canadian animals from the United States for 1898 and 1899 are given in the following table for purposes of comparison with the number of inspections, etc., shown in the table immediately preceding:—

Number of Animals Inspected and Exported for Fiscal Years 1898 and 1899.

Kind of Animal.	1898.		1899.	
	American.	Canadian.	American.	Canadian.
Cattle - - -	400,512	19,392	311,595	27,797
Sheep - - -	147,907	29,459	98,551	37,206
Horses - - -	29,570	3,955	26,351	2,685

In addition to the above animals inspected for export to Europe, there were also inspected 6 cattle destined to Jamaica, 888 to Bermuda, and 63 Canadian sheep to Argentina.

The number of certificates issued for American cattle was 1192; the number of clearances of vessels carrying live stock was 862.

The number of American and Canadian animals inspected at port of debarkation by inspectors of this department stationed at London, Liverpool, and Glasgow, together with the number and percentage lost in transit, is shown in the following table :—

Number of Animals Inspected at Time of Landing in London, Liverpool, and Glasgow, and Loss in Transit.

From.	Cattle.			Sheep.			Horses.		
	Landed.	Lost.		Landed	Lost.		Landed	Lost.	
	No.	*No.*	*Per ct.*	*No.*	*No.*	*Per ct.*	*No.*	*No.*	*Per ct.*
United States	290,609	556	0·19	71,547	436	0·61	27,836	741	2·59
Canada	19,889	189	·94	24,997	253	1·00	1,228	20	1·60
Total	310,498	745	·24	96,544	689	·71	29,064	761	2·55

Insulated Vans.—These have come largely into use in recent years for the carrying of frozen or chilled goods from ships to cold stores, or from stores to shops. They were originally built with two inches of hair felt insulation, but Lloyd's now insist on granulated cork being used with a layer of silicate cotton on the top of it so as to prevent settling. Lloyd's Inspectors in London pass all vans at the principal factories before the last boards are put on, and satisfy themselves that the insulation is properly carried out.

The insulation in the best vans now consists of three inches of cork, with a top layer of silicate cotton, held together with match boarding which form the walls, while the roof has six inches of insulation, and the floor has three inches. The roof of van is covered with waterproof canvas, and the whole exterior is painted white to deflect the sun's rays.

The outside walls may of course be finished in any style, and a common arrangement is to have thin birch panels made from wood imported from Russia, and varying from $\frac{1}{4}$ to $\frac{3}{8}$ inch thick. These are put together in thin layers, three ply, so that the grains run crosswise and are glued into boards or panels without any joints. This prepared wood is manufactured under the Venesta patents, and it will be readily understood that it is much lighter than ordinary boards, thick enough to bear the same strain. The total weight of a fully insulated van is about 45 cwts., and it is capable of carrying from 3 to 4 tons of produce.

Insulation.—This term is used to describe the materials and means used to prevent the heat of the outside atmosphere from passing into rooms or stores, which are maintained by artificial processes at a low temperature, for the preservation of perishable goods. The materials used are those which have the smallest capacity for conducting heat. The following table makes it obvious that materials differ enormously in their conducting properties.

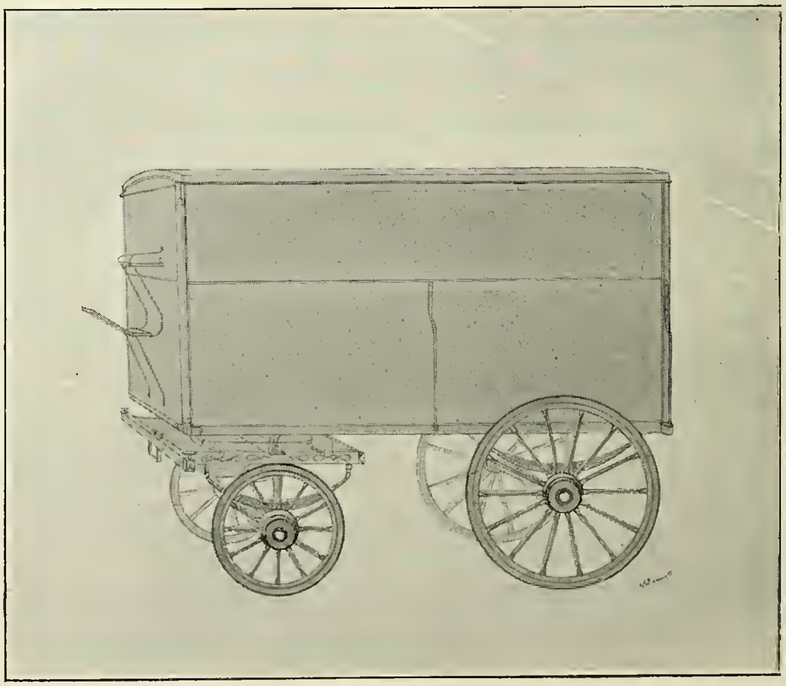
Conducting Power of Substances (Peclet).

Copper	515	Brickdust	1·33
Iron	233	Cokedust	1·29
Zinc	225	Cork	1·15
Lead	113	Chalk powder	·87
Marble	25	Wood charcoal powder	·64
Stone	15	Straw, chopped	·56
Fir (*a*)	78	Coal, sifted	·55
Fir (*b*)	1·37	Wood ash	·53
Walnut (*b*)	1·4	Mahogany dust	·52
Walnut (*a*)	·83	Hemp canvas	·42
Oak (*a*)	1·70	Calico	·40
Glass	6·6	Writing paper	·35
Brickwork	4·8	Cotton wool	·32
Plaster	3·9	Eider down	·31
Gutta percha	1.38	Blotting paper	·27
India rubber	1·37		

(*a*) perpendicular to fibres. (*b*) parallel to fibres.

To take extreme instances, copper conducts heat 2,280 times as quickly as blotting paper.

In actual practice it is found that only a few materials are available. Some of the best are ruled out because they are too dear or not readily accessible. The following table gives the conducting properties of the insulating materials most generally used, viz., charcoal, sawdust, silicate cotton, cow hair, and some others. The table also shows in parallel columns the conducting properties of the materials when wet.



Insulated Van.

Rate of Passage of Heat in British Thermal Units per Hour per Superficial Foot, through Materials 6 inches thick.

(Alex. Marcet).

T = Difference of temperature (Fahr.) on the 2 sides of the material.

	T = 60.		T = 50.		T = 40.	
	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.
Charcoal	4·70	12·30	2·93	7·50	1·76	4·40
Sawdust	6·75	15·60	4·40	9·60	2·34	5·50
Silicate cotton	4·11	14·05	2·34	8·57	1·17	6·70
Cow hair	4·11	8·80	2·34	5·30	1·17	3·50
Infusorial earth	10·00	...	6·18	...	3·57	...
Cork bricks	5·87	...	3·20	...	2·90	...

Charcoal is made from wood by heating it in a retort or other close space, until all the volatile matter has been distilled off; that made from light woods is the best for insulating purposes. It is a very good insulator but it is very dirty to work with, and the charcoal dust is apt to find its way into the interior of the chamber among the goods. It is also held by a good many people that charcoal is liable to spontaneous combustion, and that it has been the cause of fires in cold stores. On this ground the insurance companies in many cases object to its use.

Sawdust is not nearly so good a non-conductor as charcoal, but it is very cheap, and therefore sometimes used on that account. It decays and harbours vermin and is not a very satisfactory insulating material.

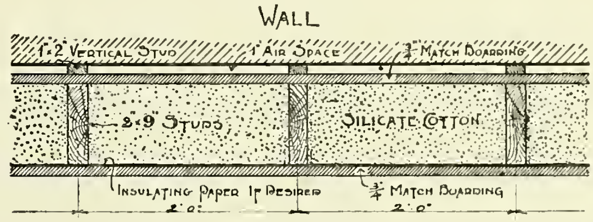
Silicate Cotton, or slag wool, is made from the melted glassy slag of blast furnaces by the aid of a current of superheated steam. It is a white cottony substance, hence its name. It is pretty generally held to be the best practical insulating material extant, and it is rapidly displacing all other insulating materials. Besides its non-conducting properties it is also fireproof, and has been the means of saving, practically uninjured, the contents of stores where it was used as the insulating material (see page 210—Burning of a Butter Cold Store in Cork).

Cow Hair is equal in non-conducting capacity to silicate cotton and is very useful for insulation on board ship, as it does not settle down and leave an empty space at the top as other insulating materials do when exposed to the motion of the ship.

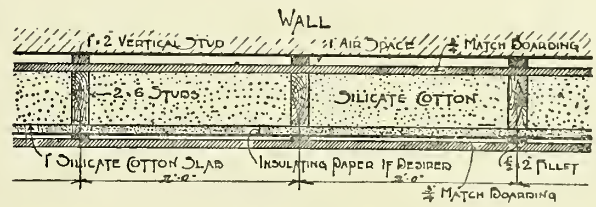
It has been ascertained from experience that the insulating of cold chambers should be done in the best possible way, and that a little extra money spent in this way at first is more than recouped in a very short time. Good insulation takes a lot of work off the refrigerating machine and lessens the coal or gas bill. But an even more important point is that, if the insulation is bad, the heat begins to pass through from the outside into the cold chamber and the temperature rises rapidly, whereas, if the insulation is good, the refrigerator may be stopped and the chambers left to themselves for as long a period as 36 hours, with only a rise of 4° or 5° Fahr. in the temperature. To attain this result the following points must be given effect to:—(1) The insulating material must be of sufficient thickness—6 inches at least, and preferably 8 inches—or even more, if the outside temperature is abnormally high; (2) The insulating material should be packed in a homogeneous manner with no vacant spaces anywhere; (3) The insulating material should be maintained in a dry condition, and should the walls of the containing building be damp, it is necessary to leave an air space between the sheeting of the insulation and the walls; (4) The doors should be well insulated and shut air-tight, being assisted in this by rubber tube or other packing; (5) The doors should also open into an intermediate room called an "air lock lobby," to minimise the escape of cold air from the interior when the doors are opened. The framework holding the insulation in position usually consists of 6 in. × 2 in. battens spaced 2 ft. apart and sheeted with 1 in. T. and G. matching, the floor, because of wear, being covered with $1\frac{1}{4}$ in. or $1\frac{1}{2}$ in. T. and G. flooring. Should the goods stored be of a very moist nature, it is advisable to cover the floor with lead soldered water-tight and turned up the sides 6 in. or 12 in. all round, or it may be covered with asphalt to prevent the moisture finding its way into the insulation underneath.

The following illustrations are sections of insulation for walls, partitions, and floors.

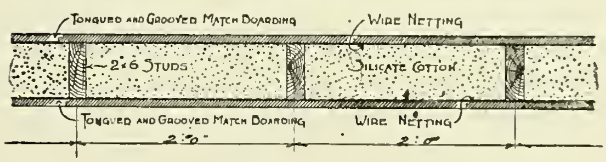
No. 1.



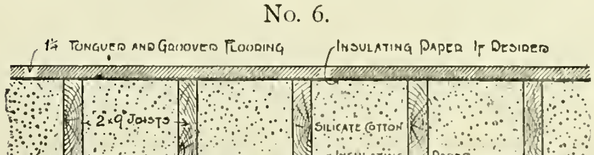
No. 2.



No. 3.



No. 6.

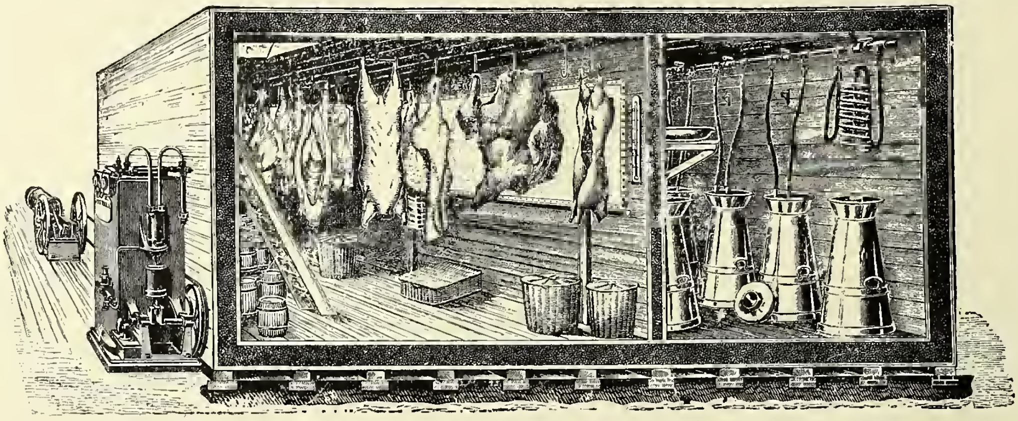


The illustration at top of next page shows the section of a cold storage installation divided into two rooms, one for meat and the other for dairy produce. The refrigerating machine and gas engine driving it are shown on the left.

Insulating Materials for Refrigerating Purposes.—Non-conducting material is absolutely essential in the construction of cold stores for any purpose whatever.

The following table shows the relative value of non-conducting materials of various kinds, and is compiled by J. E. Siebel.

The table shows the retentive power of various substances together with the percentage of solid matter in a given space (in first column). The figures in second column are for a covering one inch thick, and a difference of 100° Fahr. on each side of the covering.



Non-conductors One Inch Thick.	Net Cubic Inch of Solid Matter in 100.	Heat Units Transmitted per Sq. Foot per Hour.
Still air	...	43
Confined air	...	108
,, ,, =310°	...	203
Wool=310°	4·3	30
Absorbent cotton	2·8	36
Raw cotton	2	44
,, ,,	1	48
Live geese feathers=310°	5	41
,, ,, ,,	2	50
Cat-tail seeds and hairs	2·1	50
Scoured hair, not felted	9·6	52
Hair felt	8·5	56
Lampblack=310°	5·6	41
Cork, ground	...	45
,, solid	...	49
,, charcoal=310°	5·3	50
White pine charcoal=310°	11·9	58
Rice chaff	14·6	78
Cypress (*Taxodium*) shavings	7	60
,, ,, sawdust	20·1	84
,, ,, board	31·3	83
,, ,, cross-section	31·8	145
Yellow poplar (*Liriodendron*) sawdust	16·2	75
,, ,, board	36·4	76
,, ,, cross-section	30·4	141
"Tunera" wood, board	79·4	156
Slag wool, best	5·7	50
Carbonate of magnesium	6	50
Calcined magnesia=310°	2·3	52
"Magnesia covering," light	8·5	58
,, ,, heavy	13·6	78
Fossil meal=310°	6	60
Zinc white=310°	8·8	72
Ground chalk=310°	25·3	80
Asbestos in still air	3	56
,, ,, movable air	3·6	99
,, ,, ,, =310°	8·1	210
Dry plaster of Paris=310°	36·8	131
Plumbago in still air	30·6	134
,, ,, movable air=310°	26·1	296
Coarse sand=310°	52·9	264
Water, still	...	335
Starch jelly, very firm, ,,	...	345
Gum-Arabia mucilage, ,,	...	290
Solution sugar, 70 per cent., ,,	...	251
Glycerine, ,,	...	197
Castor oil, ,,	...	136
Cotton seed oil, ,,	...	129
Lard oil, ,,	...	125
Aniline, ,,	...	122
Mineral sperm oil, ,,	...	115
Oil of turpentine ,,	...	95

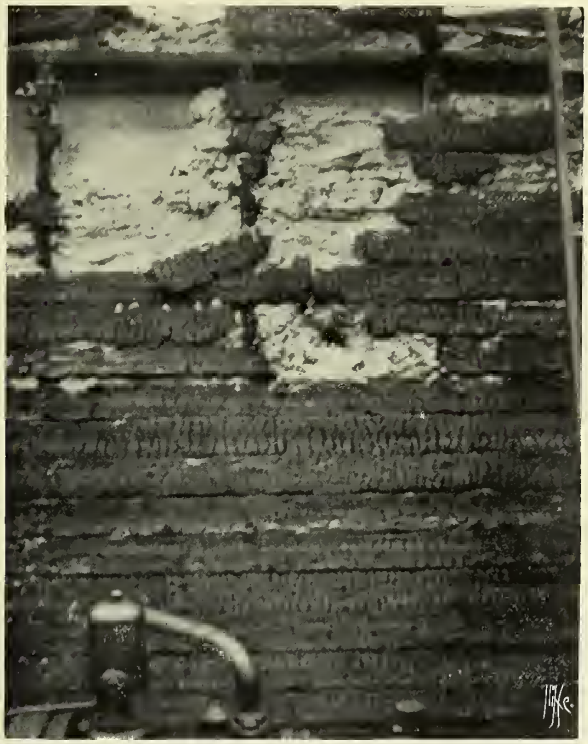
Burning of a Butter Cold Store in Cork.—(Written April 1900).—It is not often that cold stores get burned down in this country, and when a blaze does occur it interests all connected with the industry, as on such occasions much may be learned relative to constructive defects or advantages

Of such interest was the fire which destroyed the "Firkin's Crane" at Cork in January last.

The "Firkin's Crane," as it was called, was a circular building standing close beside the Cork Butter Market, and, as its name indicates, was at one time used for weighing the firkins of butter brought to the market. Since the introduction of the factory system in Ireland, however, the

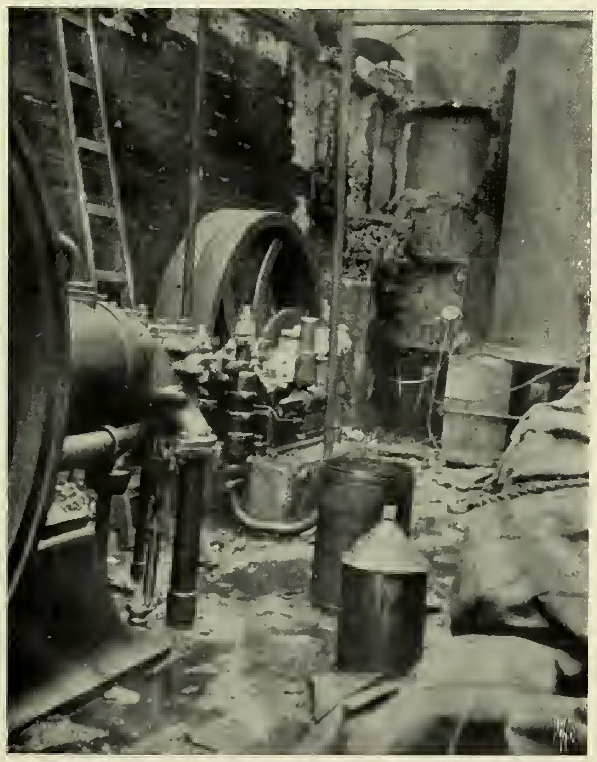
General View inside "Firkins Crane" after the Fire.

supplies of butter sent to the market have considerably decreased, and as a consequence the "Firkins Crane" or weighing house was not needed. The site is a historic one:



Portion of Side Wall of Cold Room showing how the Silicate Cotton resisted the Fire.

Top of Cold Room. Timbers burnt on outside, but Silicate Cotton prevented the Fire from getting into the Rooms. The Debris is due to the falling in of the Roof.



Portion of Gas Engine, Compressor, Evaporator, and Condenser.

Connecting Rod of Compressor and Circulating Pump.

Views of the "Firkins Crane," Cork, after the Fire.

Shandon Castle at one time occupied the ground there, to be followed in later times by a Dominican priory. In 1854, however, the Cork Committee of Merchants erected the building as it appeared lately as a weighing house for butter.

Since 1854, the "Firkins Crane" has had many uses, none, however, of a permanent character, until some two years ago, when the market trustees sold it to Messrs Burke Bros. as a butter store.

The refrigerating machinery was on the patent carbonic anhydride system, the power being derived from a powerful horizontal gas engine.

The building was completely circular, and the roof principals radiated from a strong central iron column, the diameter being 88 ft. and the total floor area available 6,100 superficial ft.

Door to Air-lock of Cold Room.

As will be seen from the reproduction of the ground plan (page 213), there were two rooms, and each had a total capacity of 6,250 cubic ft. At the time of the fire there was a stock of 25 tons of butter in the two rooms and about 14 tons outside. *All* the butter *outside* of the cold rooms was consumed, but that *in* the store was saved. Of course it was somewhat damaged by smoke and water, but a fair price (64s. per cwt.) was afterwards obtained for it.

In the series of reproductions of photographs which we show, a very clear idea may be obtained of the effects of the fire. The machinery, apparently, is not much injured, but that appearance is deceptive. The most interesting feature is the insulation; this was constructed by Messrs William Douglas & Sons Ltd., according to their usual specification, and completely resisted the fire. The photographs of the roofs and sides are interesting indeed, as showing how completely silicate cotton has proved a barrier to the heat. After the fire the silicate was seen standing up all round, showing, firstly, that it had not settled, *notwithstanding* its two year's service, and it only fell away in places through the water being played upon it.

Roof of Cold Room after the Fire.

Irish Butter Trade (Ships).—see Ships fitted for the Irish Butter Trade.

Italian Bologna Sausage.—see Bologna (Italian).

JACKETED PANS.—see Boiling Pans.

Jamaica Pepper.—see Allspice.

Jelly Preserving Powder. — A harmless, tasteless inodorous preservative, very useful for keeping jellies, and should be added to the jellies when hot, at the rate of 1 oz. to the gallon. It may also be dusted over "set" jellies with good results.

Jiggers or Jaggers.—see Pork Pie Making.

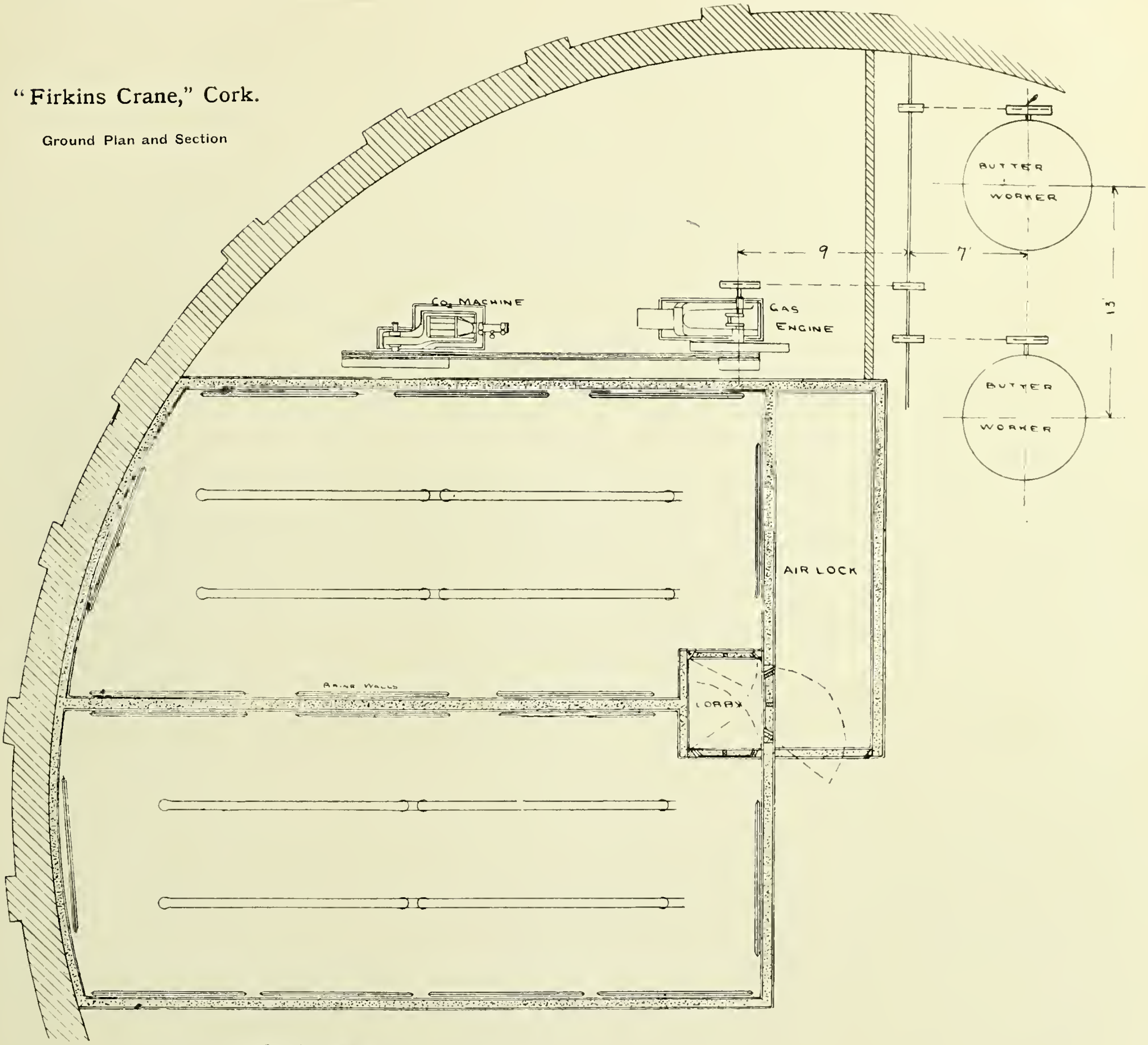
Juniper Berries and Juniper Wood.—These are both derived from the common juniper bush (*Juniperus Communis*) which belongs to the pine genus. There are many varieties of this shrub or tree, but the one which is of interest in connection with food is the common one which is found growing freely in woods and heaths all over Europe.

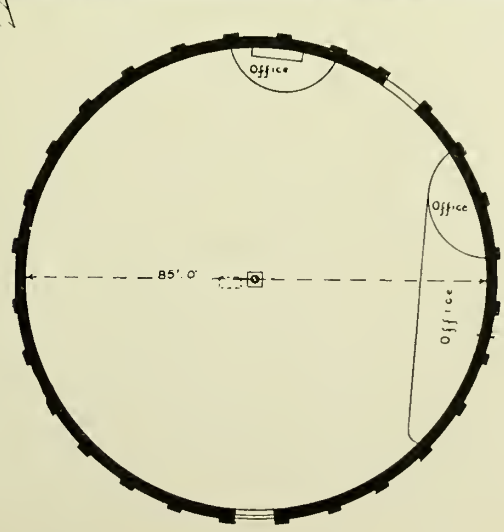
The uses of juniper berries are very many, more especially in connection with medical and veterinary practice. The wood is much used for veneering.

In bacon and ham curing the berry and wood are used to impart a flavour.

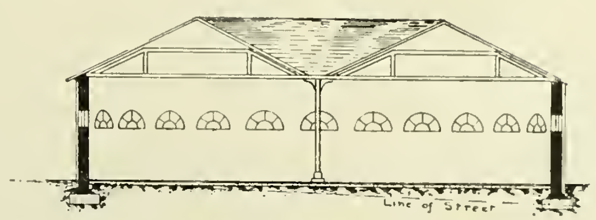
"Firkins Crane," Cork.

Ground Plan and Section





PLAN



SECTION

The berries are used in pickles partly to colour them, but more especially to flavour them. Generally they are used in conjunction with some other flavouring ingredients, such as coriander seed and laurel leaves.

The practice is to place a mixture of say 1 lb. juniper berries, 1 lb. coriander seeds, and 1 lb. laurel leaves in a cotton bag, and allow this to float about in the pickle tank—this latter being of a capacity of about 100 gallons. The juices and flavours of the mixture are slowly extracted and imparted to the meat in course of cure. This addition to pickle is only made when a special article is wanted.

The wood of the juniper is sometimes used for smoking hams and bacon. Ordinarily this is done by means of a hard wood sawdust such as elm, ash, or beech, but a peculiar piquancy is derived from the use of the juniper chips. They are scattered amongst the sawdust and are allowed to smoulder. The peculiar flavour of Westphalian hams is largely due to their being smoked with juniper chips.

Jury.—see Butchers' Jury.

KNACKWURST.—see Smoked Sausage.

Knives.—see Cutlery.

Knockpolse.—see Bacon Curing in Denmark.

Konigsberg Giant Sausage.—see Giant Sausage of Konigsberg.

Knackers' Yard, Hamburg.—see Municipal Knackers' Yard, Hamburg.

LAMB (American).—The early spring lamb reaches the eastern American market about the middle of March. The first are considered a great delicacy and command high prices, butchers paying from $8 to $12 each. They are dressed with skin and toes on. The fore quarters sell from $2 to $3 each, and the hind quarters $4 to $5. The best lamb has hard white fat on the back and about the kidneys. The bones are of a reddish colour. A plump lamb weighing 30 to 35 lbs. will bring more than one weighing 50 lbs. The best winter lambs and yearlings are raised in Canada, New York State, and Michigan.

Lancashire Boiler.—see Steam Boilers.

Lard.—Lard is a term applied to the fat of the slaughtered pig, separated from the other tissues of the animal by the aid of heat.

In the crude state it is composed chiefly of the glycerides of the fatty acids, oleic and stearic or palmitic, with small portions of the connective tissues, animal gelatine, and other organic matters.

Kinds of Lard.—According to the parts of the fat used, and the methods of rendering it, lard is divided into several classes. According to methods of rendering, lard is classified as kettle and steam. From material used the following classifications may be made:—

Neutral Lard.—Neutral lard is composed of the fats derived from the leaf of the slaughtered animal, taken in a perfectly fresh state. The leaf is either chilled in a cold atmosphere, or treated with cold water to remove the animal heat. It is then cut into squares in a fat cutting machine, and passed at once to the rendering kettle or pans. The fat is rendered at a temperature 105° to 125° F. (40°-50° C.) Only a part of the lard is separated at this temperature, and the rest is sent to other rendering tanks to be made into another kind of product. The lard, obtained as above, is washed in a melted state with water containing a trace of sodium carbonate, sodium chloride, or a dilute acid. The lard then formed is almost neutral, and should not contain more than ·025 per cent. free acid; but it may contain a considerable quantity of water and some salt. This neutral lard is used almost exclusively for making butterine (oleomargarine).

Leaf Lard.—The residue unrendered in the above process is subjected to steam heat under pressure, and the fat thus obtained is called leaf lard. Formerly this was the only kind of lard recognised in the Chicago Board of Trade, and was then made of the whole leaf.

Choice Kettle-rendered Lard—Choice Lard.—The quantity of lard required for butterine does not include all of the leaf produced. The remaining portions of the leaf, together with the fat cut from the backs, are rendered in steam-jacketed open kettles, and produce a choice variety of lard known as "kettle-rendered." The hide (rind) is removed from the back fat before rendering, and both leaf and back fat are passed through a cutting machine before they enter the kettle.

Choice lard is thus defined by the regulations of the Chicago Board of Trade:—

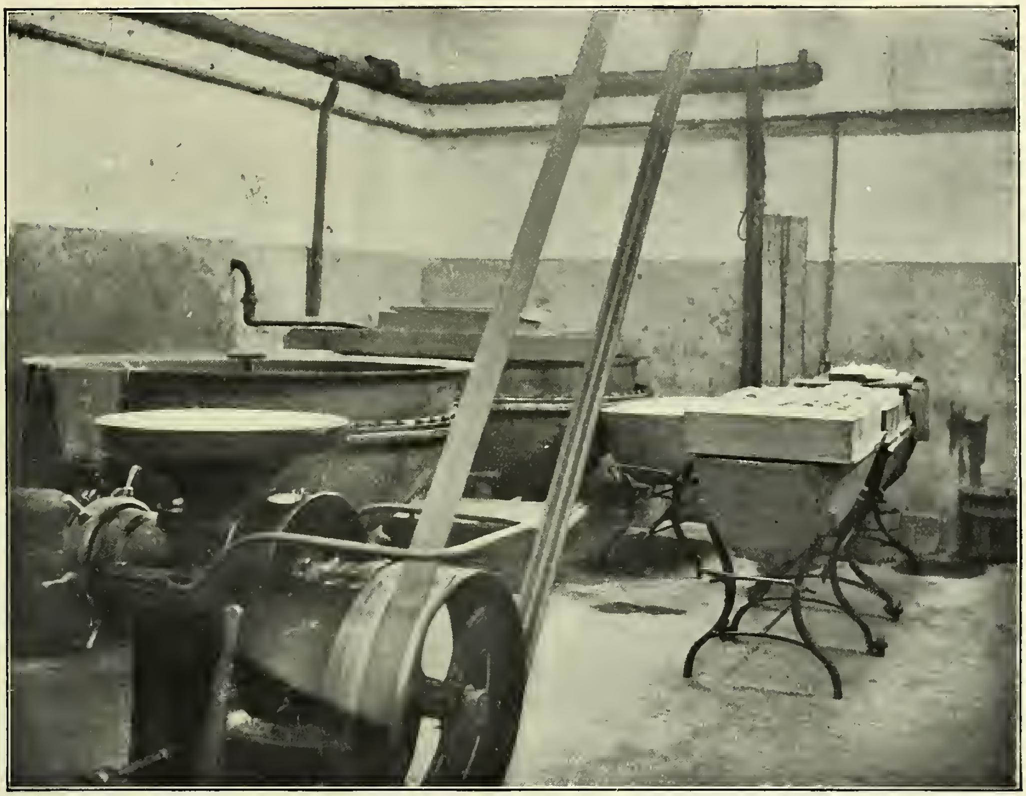
Choice lard to be made from leaf and trimmings only, either steam or kettle-rendered—the manner of rendering to be branded on the tierce.

Prime Steam Lard.—The prime steam lard of commerce is made as follows:— The whole head of the hog, after the removal of the jowl, is used for rendering. The heads are placed in the bottom of the rendering tank. The fat is pulled off the small intestines, and also placed in the tank. Any fat that may be attached to the heart of the animal is also used. In houses where kettle-rendered lard is not made, the back fat and trimmings are also used. When there is no demand for leaf lard, the leaf is also put into the rendering tank with the other portions of the body mentioned. It is thus seen that prime steam lard may be taken to represent the fat of the whole animal, or only portions thereof. The quantity of fat afforded by each animal varies with the market to which the meat is to be sent. A hog trimmed for the American market will give an average of about 40 lbs.; while from one destined for the English market, only about 20 lbs. of lard will be made.

Prime steam lard is thus defined by the Chicago Board of Trade:—

Standard prime steam lard shall be solely the product of the trimmings and other fat parts of hogs, rendered in tanks by the direct application of steam, and without subsequent change in grain or character by the use of agitators or other machinery, except as such change may unavoidably come from transportation. It shall have proper colour, flavour, and soundness for keeping, and no material which has been salted shall be included. The name and location of the renderer and the grade of the lard shall be plainly branded on each package at the time of packing.

This lard is passed solely on inspection; the inspector having no authority to supervise rendering establishments in order to secure a proper control of the kettles. According to the printed regulations, any part of the hog containing fat can be legally used.



Lard House of Modern Bacon Factory.

and then the pan will be a little cooler. Put the flake into it and melt steadily, but when it starts to boil let it boil quickly for three or four minutes. The flake scrap will only require boiling for half an hour. Steam rendered lard should be boiled at 212°, and not over 220° F.

Ordinary Flick Lard is made by passing the flick through an "Alexander" fat cutter, so that it is cut into pieces of about three-quarters of an inch square. It is then put into a steam jacketed pan and rendered until the whole becomes liquid. Some lard bleacher is necessary if any discolouration is present (see proportion to use under Lard Bleacher).

Lard to keep ought to have present about $\frac{1}{2}$ per cent. antiseptic—that is $\frac{1}{2}$ lb. preservative to every 100 lbs. lard. The preservative assists in the bleaching process.

Lard Rendering.—As practised in Wiltshire. (In some factories fire rendered lard is preferred to steam rendered, but all modern factories have steam equipment).

Before adding the cut up fat, heat the lard pans until a little fat placed in the bottom of them begins to frizzle, and keep the mass of fat on the top of them constantly on the move all the time. The fat should be put in gradually. The fire, if steam is not available, must not be forced or bad lard will result. Large lumps will be formed too. Melt steady until the white fat disappears, then increase the heat to swimming point. Finish it with a sharp boiling for three or four minutes, then damp off fire or heat. The sharper it is boiled at this stage the better it will keep. Then transfer to the settling pan, passing all the liquid fat through a strainer. Dip it out of settling pan into tubs, and stir it while cooling, so that the gut fat and flake will mix together. The gut fat if not so incorporated will settle at the bottom. Let it settle eight hours in the tubs. But while dipping it out of settling boiler into tubs, the scraps will be on the boil. As it boils you may heave it on one side and take out the fat boiled out. This should occupy an hour. When all the liquid has been removed, remove the fire and lift out the scrap and put it into the press. If this cannot be done all in one day, it must be remembered that the scrap requires heating again before being put into the lard press. The first bucketful which comes away from the press may be put amongst best lard and the remainder into second quality. This latter may be simmered up when wanted.

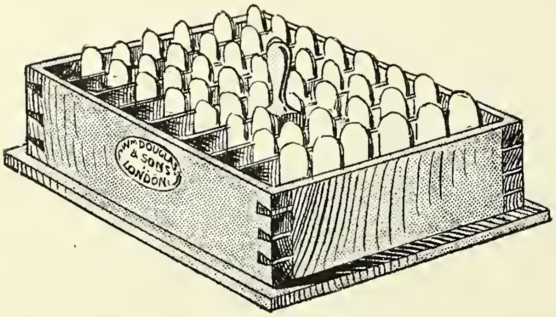
Scrap.—If a large lot has to be done do the gut fat first, as there is more scrap in it, and boil it up. The scrap will have to be boiled for an hour and-a-half and put upon a strainer. At same time damp up the fire and push the damper in,

Lard Agitator.—Where lard has been first melted, then refined by heating in a second pan, it is pumped up or allowed to fall by gravitation into the lard agitator, which consists of a half jacketed pan of about 15 cwts. working capacity. In this jacket either steam or water can be let on. The lard is first of all agitated by means of a stirring gear, under heat. When it has been thoroughly mixed, the steam is turned off, and water may be turned on to the jacket, but the cooling effect must not be too precipitate, otherwise the lard might set. When the lard appears to be on the point of settling, or just sufficiently warm to run, it should be run out of the agitator, either into the cold lard filler or into barrels or other packages.

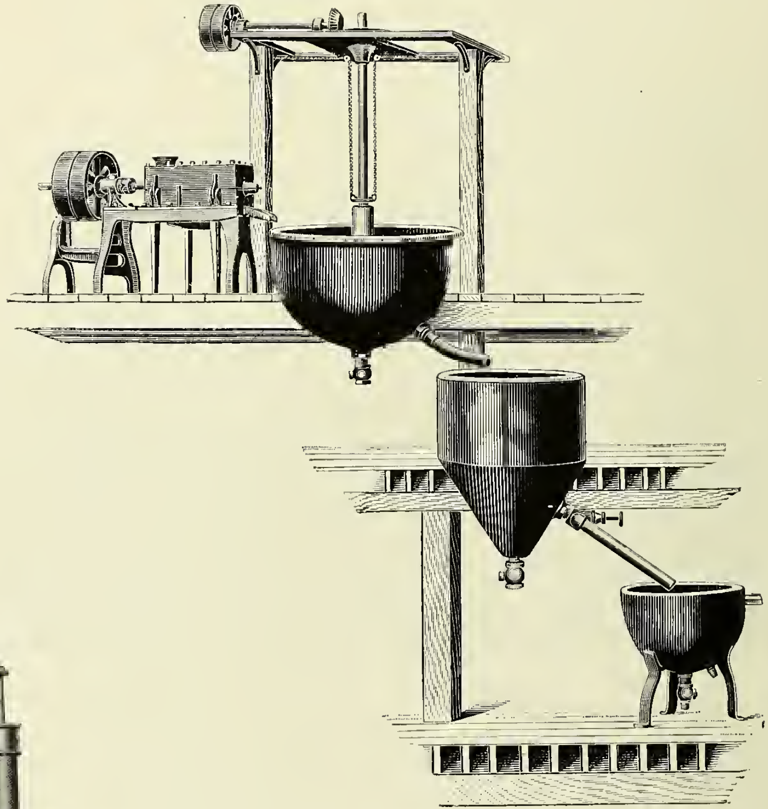
The object of the agitation is to thoroughly incorporate the stearine and the oleine which may have been separated in the process of rendering.

Lard Bleacher.—A specially prepared powder for whitening and stiffening lard. It is used as follows:—1 lb. of the powder is dissolved in half a gallon of hot water, and and poured into the pan of lard while the lard is melting. The above quantity does for 100 gallons of lard.

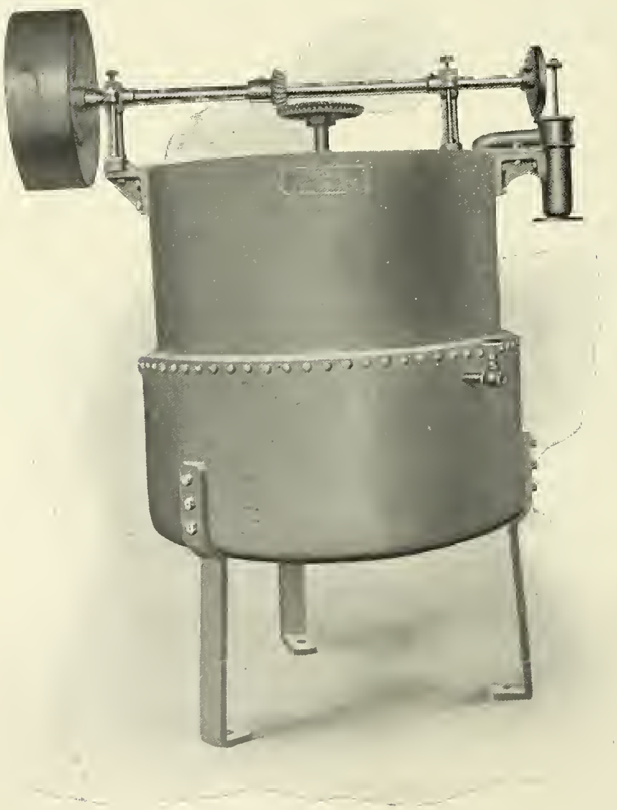
Lard Blocking Frames.—Wooden frames with moveable divisions for making up paper packages of lard. The frame sits on a loose bottom, which enables the packages to be easily cleared from the frame. The *modus operandi* is as follows:—grease-proof paper bags are distended by inserting a wooden block, and then pushed into the compartments. The lard is run into each in a semi-cold condition, and when the whole have thoroughly set, the



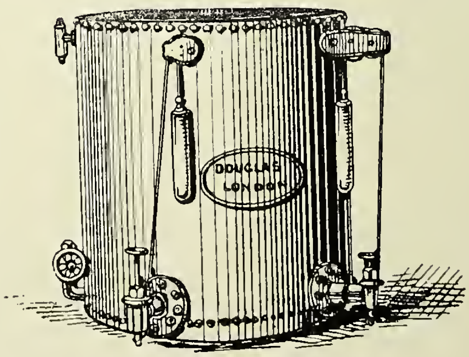
Lard Blocking Frame.



American Lard Rendering Plant.



The Douglas Lard Agitating Pan.



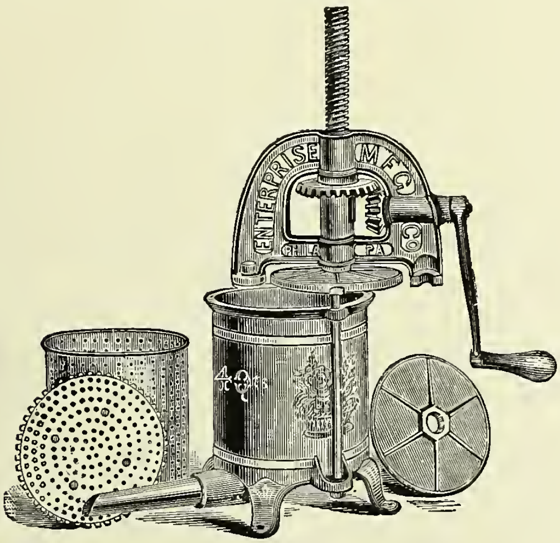
Lard Filler and Heater.

frame is lifted, when the moveable divisions and the packets of lard are left on the loose bottom. The moveable divisions are put into position and the frame is again ready for use.

Lard (Cold) Filler.—see Cold Lard Filler.

Lard Filler and Heater.—This is an appliance used by pork butchers for filling lard into bladders. In bacon factories lard is generally filled into bladders *cold* (see Lard).

Lard Presses.—There are many forms of lard presses, all having for their object the saving of the residue of lard which adheres to the greave or animal tissue, which is left in



Lard Press to deal with four quarts.

the rendering pan and which has to be lifted out. The quantity to be dealt with is about the best guide to follow in this matter. Thus to begin at very small quantities we have the Enterprise lard press, which is made in vertical shape to deal with four or eight quarts respectively, after that the shapes and sizes vary; thus:—

Lard Press made in following sizes:

No. 1, with cullender, 9 in. diameter.
,, 2, ,, ,, 12 in. ,,
,, 3, ,, ,, 15 in. ,,
,, 4, ,, ,, 18 in. ,,

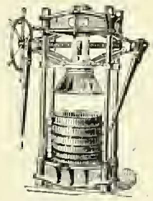
The build of this form of press is very light and it is not meant for factory work, it is more adapted to pork purveyor's establishments. For factory work the form is much stronger.

In the foregoing it will be observed that the piston of the presses are forced down by levers, thus giving a greatly increased pressure.

To attain the same end another form is sometimes adopted and the power is applied by turning a wheel at the side of frame. This wheel being on a shaft and having a worm fixed to it, so that it revolves a wheel revolving on the central spindle. The force applied in this case is also very great.

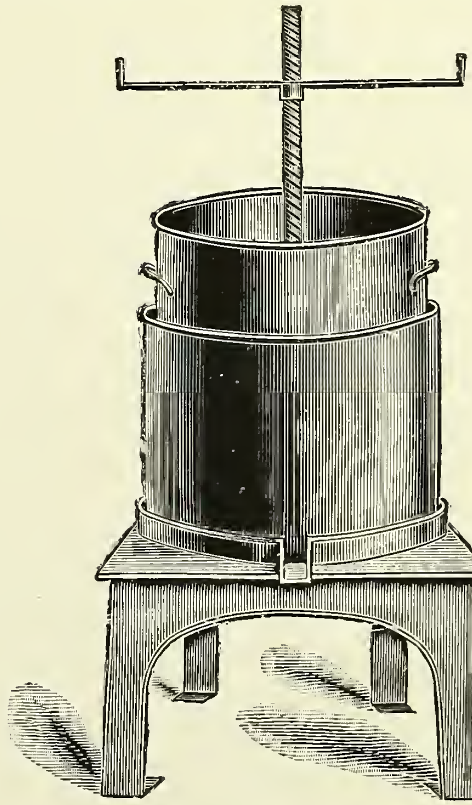
Recently, hydraulic power has been applied to this work with success. There is every reason to think, that, where a large quantity of greave or scrap is dealt with, it pays to have the last residue of fat squeezed out, and by hydraulic power this can certainly be done effectively.

In the United States the form much favoured is described as a *Knuckle Joint Scrap Press.*



Knuckle Joint Scrap Press.

This press is for pressing kettle rendered lard and tallow scrap, and is all iron and steel. The follower is composed of a heavy nut and screw, making it adjustable to get the full power of the knuckle joints. It is attached to the plate in such a way that it can be swung back, uncovering a portion of the hoop, and making it more convenient for putting in the scrap. The hoop is composed of a section of staves bolted to the base, to which are hinged two doors, completing the circle. These doors are composed of wrought iron bands, to which are riveted perpendicular staves, with a space of about one-eighth of an inch between each. The staves are



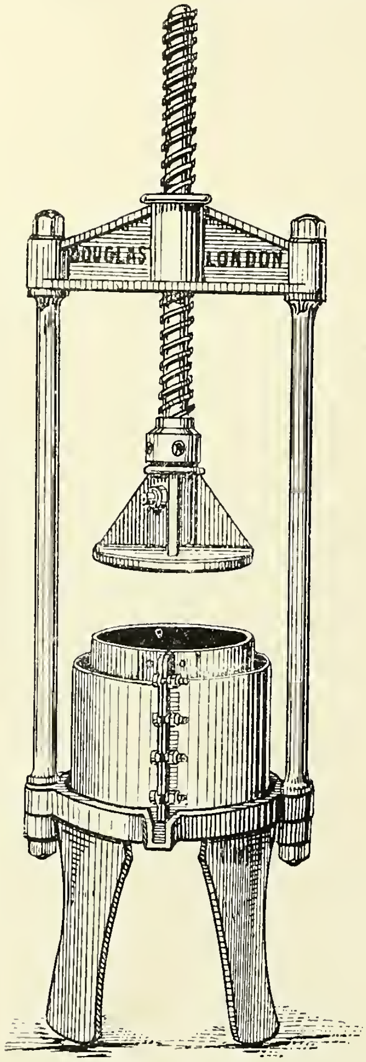
Lard Press.

one-half inch thick and made narrow on the back, thus giving a large opening under the bands, and avoiding the stopping up heretofore experienced in this class of hoops. The ends of the bands are securely held by steel links which lock them together. The base has ribs cast on the upper surface, over which, inside the hoop is placed a plate perforated with holes.

Lard Rendering Pans, etc.—The manipulation of lard is considered a difficult matter, the object being to obtain a nicely grained and white article.

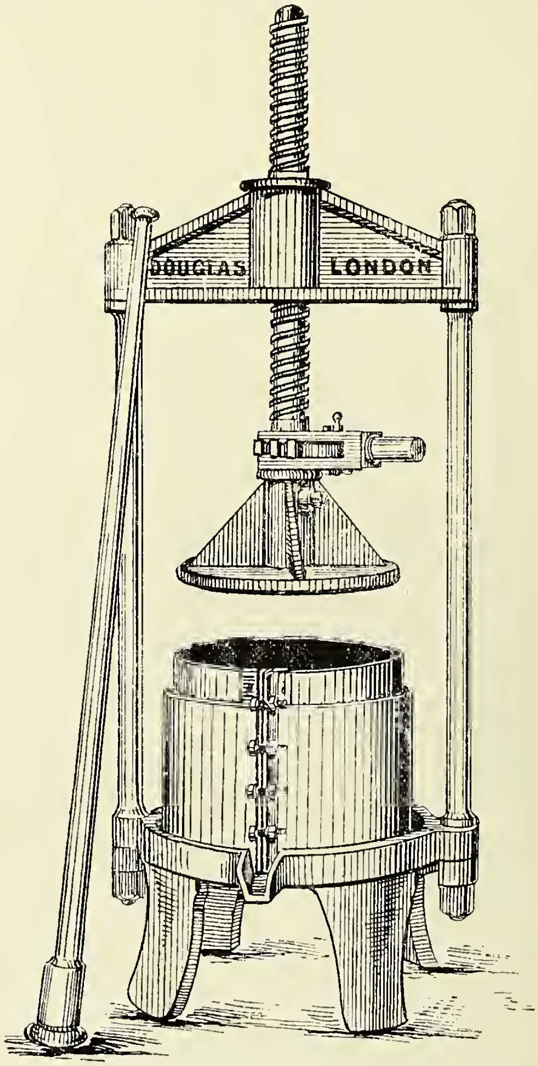
The appliances necessary are not numerous and much depends on the personal skill of the workman in charge.

In a small way, after the fat is cut in an Alexander fat cutter, into pieces about quarter of an inch square, it is placed



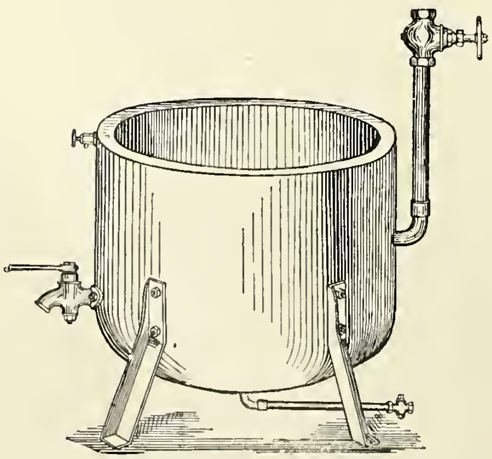
Extra Heavy Lard Press.

Made of Wrought Iron, and giving a pressure up to five tons.
Cullender 12 in. diameter.



Extra Heavy Lard Press.

Made of Wrought Iron, and giving a pressure up to ten tons.

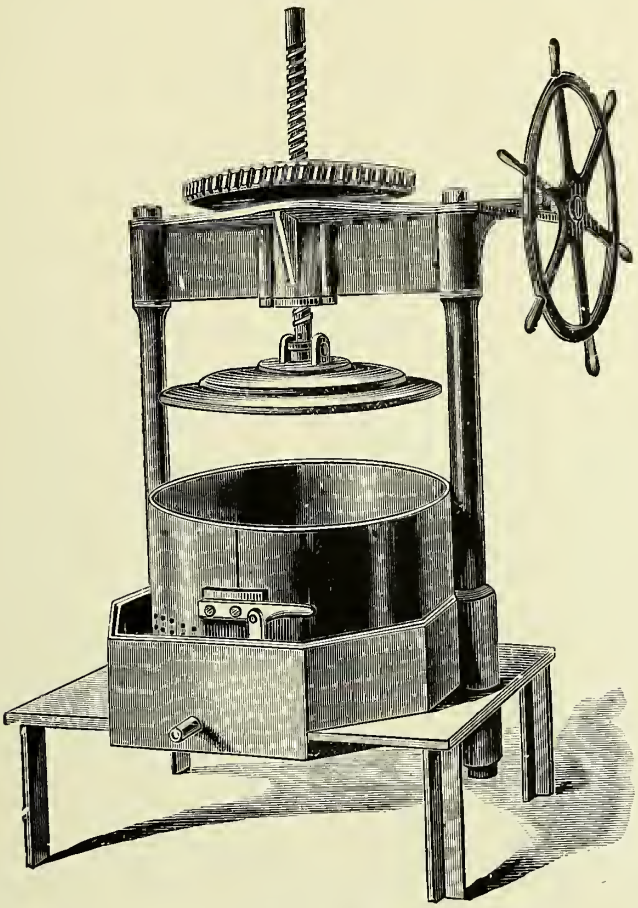


Small Steam Jacketed Lard Rendering Pan.

Working capacity, one to five cwt. of lard.

Three-quarter Jacketed Lard Rendering Pan.

Working capacity, about fifteen cwts. of lard.



Lard Press with Side Wheel.

in a rendering pan. According to the size of the business done, this pan may be either small or great. In the small way a very small pan will serve, but in the large way it is necessary to have larger apparatus.

In a bacon factory handling 500 pigs per week, there will be two such pans required—the one for first rendering, the other for refining.

Continuous processes have been tried but have not met with much success. The following is a description of one of these.

Continuous Process for Rendering Lard.—A in the figure represents a fat cutter (see page 222), through which the crushed fat passes into a wrought iron steam jacketed pan B, which is provided with an automatic stirring and scraping apparatus. The stirrer causes the fat to be uniformly melted, whilst the scraper prevents any greaves from adhering to the bottom or sides of pan and thereby becoming burnt.

A cover is provided which fits air-tight and keeps in all heat and steam, thus assisting melting; and the outside air being excluded prevents the greaves becoming brown, thus lessening the risk of discolouration to the lard.

The lard, as fast as melted, drains off at a low temperature through a conical strainer and flows into boiling pan C, which is also steam jacketed and provided with an agitator to secure an even temperature. Here it is allowed to accumulate till the melting is complete, and then steam is turned on until it is sufficiently boiled. It is then drawn off by means of a stop-cock into the settling pan D, where it is allowed to stand and settle, ready for bladdering or putting into tins.

The advantages claimed are:—

1. The immense saving in labour, as the lard does not require to be handled from the time it is put into the hopper of fat cutter, till it is ready for bladdering.

2. The fat after passing through the mill is forced directly into the pan, thus saving handling and consequent waste.

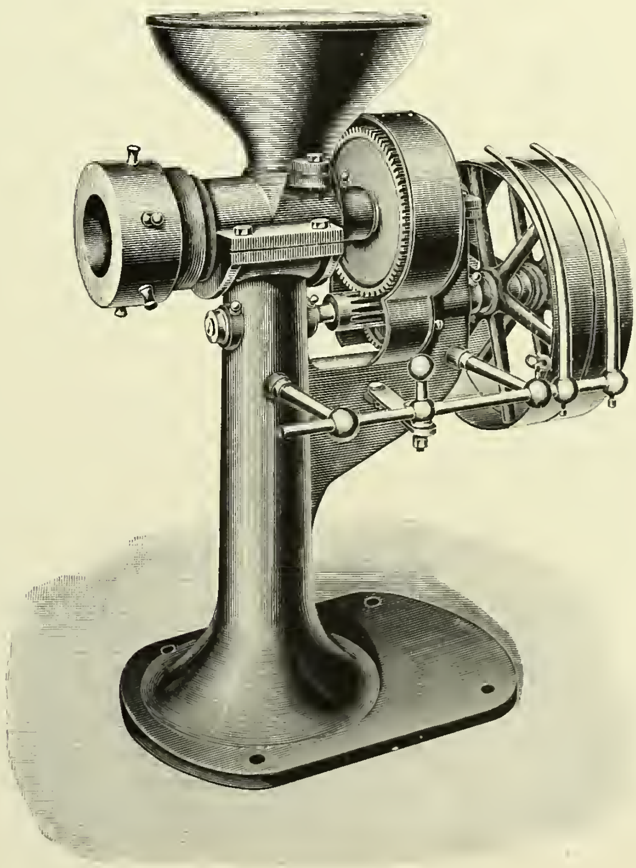
3. The melting pan being enclosed, there is no loss of heat and no risk of discolouration.

4. Automatic stirring and scraping is far superior to hand work.

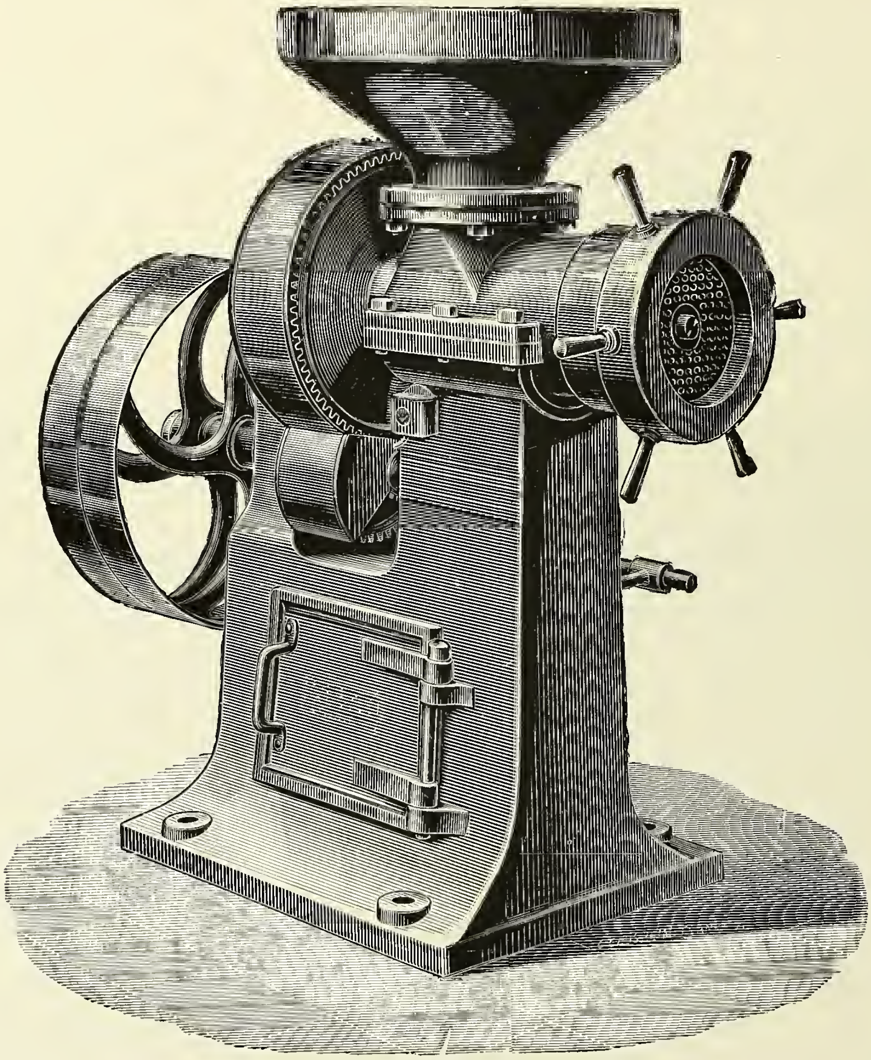
5. The lard being drained away from the greave as fast as melted, all risk is avoided of over-heating and causing a burnt smell or taste.

6. In the boiling pan nothing but the lard has to be dealt with, the greave being left behind in the melting pan and in consequence less heat is required.

The apparatus is fitted and finished in the best possible style; the steam pans are of wrought iron, tested to 125 lbs. per square inch by hydraulic pressure. The outside is cased with wood, put on in narrow strips and varnished. The driving gear is fitted with fast and loose pulleys and belt-shifting gear and fly-wheel.



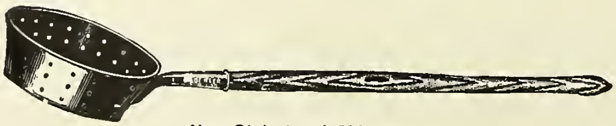
Alexander Power Fat Cutter for Lard Cutting.



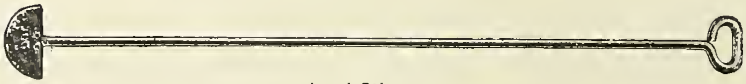
Large "Alexander" Power Fat or Lard Cutter.

Flat Lard Skimmer

Lard Dipper.



New Style Lard Skimmer.



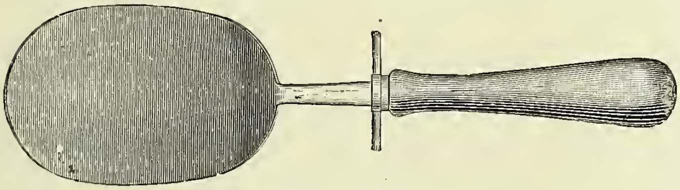
Lard Stirrer.

Lard Scoop.

Lard Renderers' Tools.—In lard making as in all other businesses, the workman is of very little use without his tools; given a good rendering pan and a set of tools, the produce is likely then to be satisfactory, provided the workman knows his business. The illustrations on preceding page show what are necessary.

The "lard scoop" is used for transferring liquid lard from one pan to another, or for skimming off the top froth. For the same purpose of skimming is the "lard skimmer." So as to have a deeper lift of the frothings, the "new style" of lard skimmer has been devised. The "dipper" is handy for lifting either lard or sediment from the bottom of the pan. The "lard stirrer" should be the most constantly used, as it is necessary during rendering always to keep the fat in a state of agitation. The rounded face enables the operator to stir right round the pan easily and prevent the greave from settling.

Lard Trowel.—A trowel with a plated body and cross bar to keep the hand from slipping, used for dividing out lard in the shop. It is a useful tool and does the work in a better way than by using a knife or spoon.

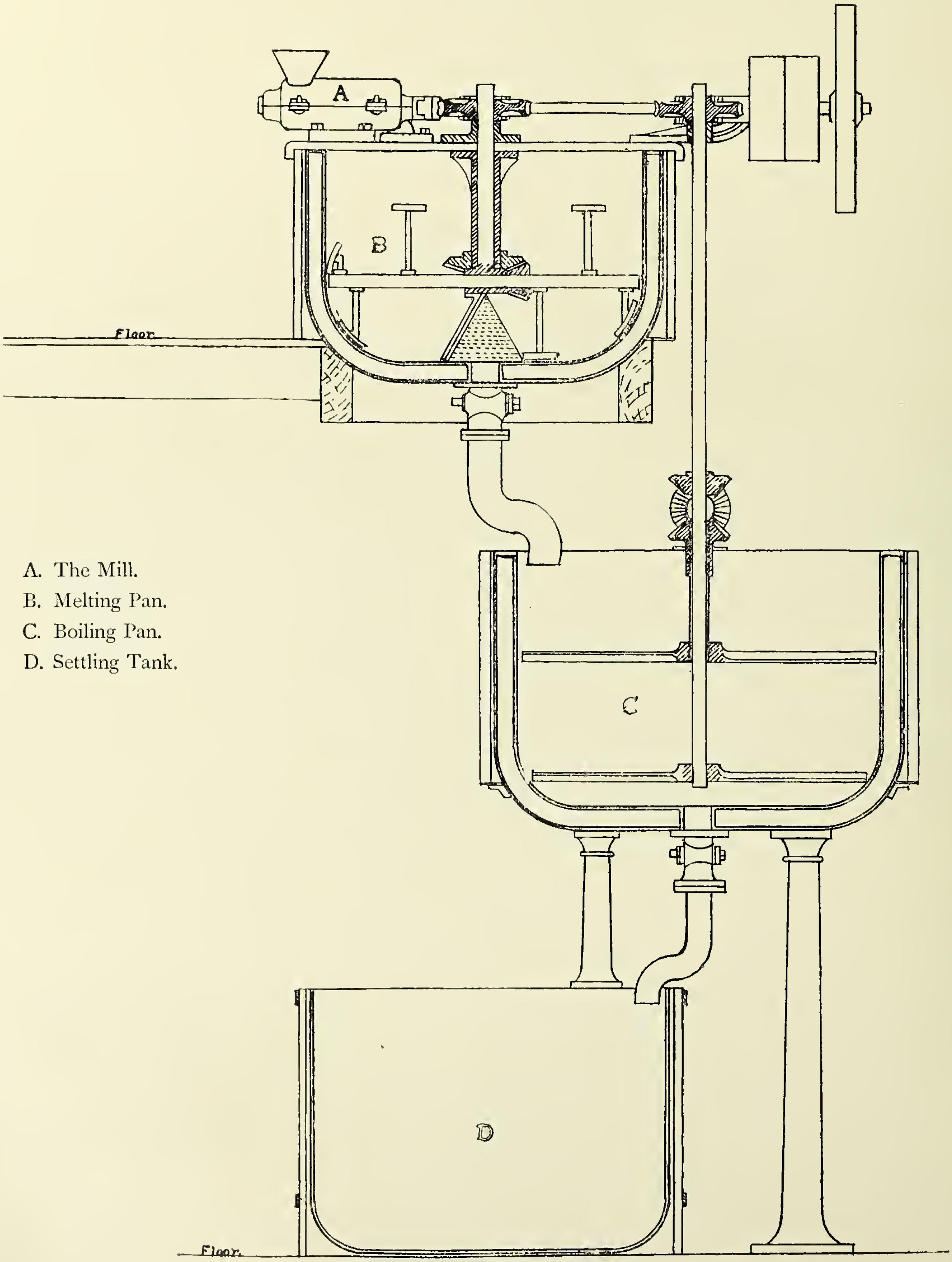


Lard Trowel.

Large White Pigs.—(By Sanders Spencer).—To attempt to describe the original source of the large white pig, would, I verily believe, result in my having to write a history of the original pig of this country, since, so far as I have been able to discover after many years of research and enquiry, there existed in ancient times but one kind of pig in the British Isles, and that one was of a white colour, or a white with blue spots of varying size on the skin. A writer of the eighteenth century when describing the pigs of the country, made no mention of pigs of any colour other than white ones. If we consider this view of the question, it really seems to be quite feasible, as, if we go North to Scotland, to the West into Wales, to the East into Norfolk and Lincolnshire, and make enquiry as to the colour of the pigs in times gone by, we shall have a similar answer, viz., that they were white or white with blue spots. Against this view may be urged that in the Southern and South Western counties are to be found many black pigs; it is so, but there are still many persons who have a clear recollection of the importation into England of the so-called Neapolitan pig, and the part it played in the formation of the present small black Berkshire and other breeds, or types of pigs found in various localities. No one would contend that the present type of large white pig bears a very strong likeness even to the Yorkshire pig as it existed at the beginning of the last century. Some engravings are extant which lead one to think that the Yorkshire, Lincolnshire, and Cambridgeshire pig of the earlier portion of the nineteenth century, was, when matured, an immense and by no means handsome beast, white or white blue in colour, curly hair, coarse in skin, bone, and meat, or at least when it reached two years old. How then, it may be asked, has the vast change been brought about, as the best type of large white, such as the foreigners in all parts of the world have bought, and continue to buy, in increasing numbers, is of a totally different character. The great credit for the first improvement rests mainly with the weavers, mechanics, and others in Yorkshire and Lancashire, who utilised the thin skinned fat producing and prolific Chinese white pig on the big Yorkshire sows, in order to breed a quick maturing and early fattening pig with which to win prizes at the many local shows, which, even in the earlier part of the century were held in Lancashire. Those pioneer breeders appear to have crossed the common sow of the district with the short legged and compact boar possessing a considerable proportion of Chinese blood; then the produce again, would be mated with boars of varying size so that the result would be pigs of almost all types. A few of the more intelligent of the North countrymen selected some of the largest of the pigs bred in this haphazard way, and continued to mate their produce until something approaching fixity of type was secured; again, others preferred the more compact and shorter headed type of pig, which eventually became known as the middle white, whilst a few adhered more or less closely to the smallest and so-called prettiest pig of which several were sent South and crossed with pigs of a somewhat similar type, but with less hair when they bloomed forth as small Yorkshires, small whites, or had given to them a name indicating their place of birth.

About the year 1840 there appeared at the local shows some specially fine white pigs of the large type, these were rather short in the head, fine in the skin and bone, wide in the back, and carried a large proportion of fat meat and lean. Then followed a fancy for producing the longest possible pig, size and substance ranking highest in estimation. Some immense animals were produced and exhibited locally, when Mr Wainmans and one or two others were

Mr Sander Spencer's Pedigree Pig Farm—Holywell Manor St Ives, Huntingdonshire.



A. The Mill.
B. Melting Pan.
C. Boiling Pan.
D. Settling Tank.

Continuous Process for Lard Rendering.

seized with the idea of purchasing and exhibiting some of the best of the so-ealled large Yorkshires, the result proved profitable, and in the eourse of a few years the system was adopted by several other exhibitors, ineluding Messrs C. E. Duehcring, Mr Peter Eden, Messrs I. & T. Howard, Mr Matthew Walker, and others, the two last mentioned going in for the breeding on a fairly large scale, so that at one time, perhaps, the best large white breeding pigs were in their possession. The Messrs Howard's foreign eonneetion furnished them with good opportunities for disposing of their pigs abroad, and

Yorkshire Sow

probably to this is due in a great measure the faet, that very few of the present day pigs ean be traced to pigs bred in the Clotham Park herd. No so with the herd originally kept at Chaddesden by Mr Matthew Walker; a considerable proportion of the most sueeessful of the present large white tribes are deseended from it. During the latter portion of his life, Mr Walker adopted the system then, and now very common, of breeding a few pigs and dealing in as many as could be sold through advertising. This dealing was about that period rendered more profitable by several men of means taking up the exhibition of pigs. To sueh an extent was this dealing and showing carried on, that about the year 1877, an Ameriean stoek paper railed at the Ameriean pig-men for spending large sums of money in England on so-ealled pedigree pigs, when, at the Royal Show, a considerable proportion of the winners were exhibited as age and breeder unknown, one exhibitor winning something like seven awards with pigs of whieh nothing of value was known as to their breeding. Another system which was adopted by North country exhibitors was that of showing pigs when young as of the small and middle white breeds, then as the pigs matured, the smaller ones figured as middle, and the largest as large whites. The only possible result followed: Litters of pigs bred from these royal prize winners would be of all sorts and sizes. It was simply impossible to carry on a herd of pigs in sueh a way, and what was far worse, it was beeoming more diffieult to purehase pure bred animals, or even sueh as would most probably produee pigs of a similar eharaeter to themselves. A few of the ehief breeders of pigs were of opinion that by establishing a herd book for pigs of all breeds the diffieulty would be at an end. For a time it appeared as though sueeess would wait on their efforts, but these hopes have not been realised; it has remained to a few of the prineipal breeders of Yorkshire pigs to keep up their own herds to a eertain type fixed on by themselves, and to leave other breeders and dealers to follow their own systems. As to the intrinsie value of a really good large white pig for breeding pure, or for crossing on pigs of every kind, or in any eountry, there is not the slightest doubt; and the large whites are also first rate eolonists. Personally, I ean write with every confidence as I have exported large white pigs to nearly all parts of the world, to countries with temperatures of extreme heat and cold, and in every eountry have these pigs thriven well. This I attribute to the faets that the natural eolour of a pig was white or grey, and that the pigs in any herd have for many generations been bred on praetieal lines. It is true that they have been most suecessful in the show yards of the world, but this exhibition with me has been a secondary eonsideration, no animal has been kept in the herd after it had proved itself to be wanting in one of the ehief qualifieations sought in a profitable pig.

The large white pig has of late years been so frequently deseribed, and has been endowed with qualities and form so extraordinary, that I hesitate to give my view of the matter. Perhaps it will be best for me to describe the kind of pig I sought many years sinee, when I first beeame enamoured of the large Yorkshire. Quality of bone, skin, hair, and meat were imperative, as a pig deficient in these qualities must fail to be profitable to the feeder or to the consumer. As to the size, I have always found a little pig one to give most satisfaetion, a well formed and eompaet pig being almost invariably a hardy and thrifty one; the boars will be docile and prolific whilst the sows will not only produee large and healthy litters of pigs, but they will furnish a plentiful supply of rieh milk for their youngsters. A head of fair length with little jowl and wide between the forehead, shoulders light and obliquely plaeed, then the floor of the ehest will be wide and plenty of room provided for the heart and lungs to work; the ribs should be well sprung, the side long, and the flank thick but not gritty, as are some English and most of the foreign pigs. Width of baek is not essential, provided that it be muscular, another sure indication of plenty of lean meat; the hind quarters should be long and wide so that the pig has a wedge like appearanee when viewed from behind. About the size and depth of the hams there is a variety of opinion, those butchers and eurers who pay attention to the ham trade, naturally think more of a well shaped and fully developed ham than do those curers whose trade is mainly in the ordinary sides of bacon. We hear a great deal about the urgent neeessity for size in large white pigs. This is mainly from those breeders or dealers in pigs who are positively unable to piek up at markets or on farms, really good large white pigs, but who can with ease find any number of gaunt coarse

Middle White Yorkshire Boar, "Holywell Georgie," the property of Mr Sanders Spencer.

boned monsters whieh require a year or two to mature, and furnish a suffieient excuse for the following most extraordinary foot note to the so-ealled standard of excellenee as determined upon by eertain members of the N.P.B.A.

"Large bred pigs do not develop their points until some months old, the pig at five months often proving at a year or fifteen months a much better animal than could be anticipated at the earlier age and *vice versa*." Could a more convincing proof be furnished by the arch enemy of large white pigs of the totally wrong system which has been and is being followed at the present. Just imagine if such be possible. The council of any herd book society lending itself to such an idea, that after having forty or fifty years careful breeding, the produce may grow all or any way, even after it has arrived at an age when the large proportion of the particular variety of stock has given up its life for the public good. The great advocates for pure bred pigs claim, and justly claim, that one of the chief benefits derivable from purity of breeding is the almost absolute certainty, that like will beget like, and that what the young animal is, so will be the matured pig. It may not be out of place to refer to a letter recently written by one of the oldest and most revered of stock breeders in the Eastern counties. It was written as a contribution to a newspaper discussion as to the best breed of pigs for bacon curing purposes. The author of it related that during his long life he has bred all kinds of pigs, save wild hogs, Tamworth's, which he considered very similar, and the top eared black, and that no kind of pig had proved as profitable to him, nor furnished at so young an age such fine meat at so little expense, as had the large whites.

Laurel Leaves.—see Culinary Herbs.

Lausanne Meat Cheese.—Take equal quantities of lean pork and bacon and a double quantity of veal, and chop them together very fine. To 22 lbs. of this add 1¼ lbs. of young pig's liver, also chopped fine and some eschalots. Mix well, and add one or two handfuls of flour, 9 ozs. of salt, 1½ ozs. pepper, ⅙ oz. ground cloves, and ⅙ oz. ground cardamom. Grease a tin with lard, and fill it with the above mixture. Cover the top with small pieces of lard, and bake for two hours in an oven. Pour off any fat, and let the cheese be pressed very tightly, still keeping it in the tin. When perfectly cold take it out, and it is ready.

Lemon Thyme.—se Culinary Herbs.

Leverpolse.—see Bacon Curing in Denmark.

Leverpostej.—sce Bacon Curing in Denmark.

Lifts.—see Hoists.

Limerick Cheese.—These are made from the following recipé:—

21 lbs. lean pork.
7½ ,, fat.
¼ ,, dry antiseptic.
¼ ,, white pepper (No. 2).
¼ ,, salt
3½ ,, farinaceous stuff (such as either rice or pansitose).
2¾ ,, suet.
¼ noggin of cochineal.

Liver Cheese.—For this a tin mould is needed of 12 inches long, 6 inches high, and 7 inches broad, and a very close cover. The mould should be lined with raw white finely slieed back fat, also the cover.

6 lbs. finely minced raw liver.
4 ,, raw lard.

Mix together, and add four eggs, 6¼ ozs. fine salt, ½ oz. fine white pepper, ⅕ oz. thyme, ⅕ oz. nutmegs, ⅕ oz. mace, ⅐ oz. cloves, four eschalots, fried in fresh butter a nice yellow, and grated and salted. Now mix all together, and put into the mould. Then lay on the eover of back fat, then the well-greased lid. Shut up tight, and put the mould in boiling water, and let it boil for two and a-half hours gently. Afterwards let the shape stand for twelve hours until perfectly eool, then set it for an instant in warm water, take off the eover, and turn out the mould on a clean plate.

Instead of being boiled, this liver cheese could be baked in an oven till ready.

Liver Sausage.—Take 100 hog's livers (you can, without doing any harm to the sausage, take to every two hogs' livers one calf's liver). Cut them in slices, take the blood vein and fibre out, put in a tub and scald with hot water; repeat this operation until the livers look clean and white; chop the whole, then add 12½ lbs. fat from the intestines, which should be boiled half an hour before, mixing with the balance; then chop the whole onee more. Add 5 lbs. fat pork cut into small pieces, boil the whole half an hour, then mix with the following spices:—7 ozs. salt, 1 oz. ground marjoram, ½ oz. ground sage, ½ oz. ground thyme, 2 ozs. ground pepper, ½ oz. basil.

To increase the amount besides using livers, you may use veal from the head, the kidneys, and other parts of veal that are not readily saleable. Stuff in hog casings or beef rounds. Cut into lengths of from eleven to thirteen inches. Boil for thirty minutes in the broth which was obtained from the preparation of the meats. If the sausages are large, boil perhaps thirty minutes longer. During the boiling the sausages should be continually turned with a wooden ladle and pricked with a fork or other sharp instrument. After removing, immerse for four or five minutes in clear cold water. If these sausages are cooled too slowly, the fat will not be distributed equally among them, but will have a tendency to collect on the upper side.

After cooling, the sausages should be hung in the open air from ten to twelve hours in summer, and from two to three days in winter, when they are then ready for smoking, which must be continued for six days.

Liver Sausage (Goose).—Take 20 lbs. white goose livers, place in clear cold water for two hours. To 40 lbs. hogs' livers (one-third of this amount may be ealves livers, from grown calves), add 15 lbs. well cooked veal, 18 lbs. cooked fat from the intestines, 7 lbs. raw fat pork, chop fine together and add 23 ozs. salt, 7 ozs. ground pepper, 1½ ozs. ground nutmeg, 1 oz. ground cinnamon, 1 oz. thyme, and 1 oz. ground marjoram.

If the mass be too stiff, add a half pint of water. To this add the watered goose livers cut into thin slices about $\frac{1}{16}$th of an inch thick, and stuff in hog bungs, using the largest nozzle of your stuffer. Prick with a fork before cooking, or the easings will burst as soon as put in the hot water. Cool and smoke the same as with plain liver sausage.

Liver Sausage (Truffle Goose).—Take 30 lbs. hogs' livers sealded and eleaned as usual, 18 lbs. eooked fat from the intestines, 12 lbs. raw fat pork, and add 30 lbs. watered goose liver; mix and chop fine, then add 10 lbs. more goose liver cut into small cubes. Season with 26½ ozs. salt, 9 ozs. ground pepper, 50 ozs. truffles cut into pieces the size of a hazelnut, and proceed the same as in goose liver sausage.

Liver Sausage (False).—To 30 lbs. cooked hogs' neck, add 30 lbs. of cooked tripe, 25 lbs. fat from the intestines, 15 lbs. cooked veal, 10 lbs. lean pork, 36 slices of eschalots, which have been fried in lard, and chop finely together; add 31 ozs. salt and 7 ozs. ground white pepper.

Stuff in absolutely clean beef middle casings. Special care must be taken that the sausages are stuffed firmly and tied stoutly. They are then cooked in clear water or broth for half an hour. Remove and cool quickly in clear cold water. They are then ready to hang in an airy place and will keep without being smoked for several weeks.

Liver Sausage (Raisin).—Take 100 lbs. of prepared hogs' livers, scalded until clean and white; chop and add to it the brains of twenty-three calves. Mix with it 10 lbs. wheat bread, 90 ozs. raisins, 90 ozs. currants, 90 ozs. coursely ground blanched almonds, 90 ozs. pulverised white sugar, 70 ozs. medium sized onions, which have been previously chopped and fried brown in lard. Mix well, stuff into narrow hog casings, and tie in circular form; boil about fifteen minutes continually stirring. After removing from copper, cool quickly in clear cold water. The sausages are not suitable for smoking. In winter they will keep from six to eight days, or as long as they remain frozen.

Liver Sausage.—To every two hogs' livers add one calf's liver, cut in thin slices, taking out sinews. Scald well with hot water until the livers look white and clean. Chop well, adding one-eighth the amount of pure fat from the intestines of a hog, boiling the fat for half an hour before mixing. Mix and chop together again very fine, adding 4 ozs. of fat pork to every 5 lbs. of the balance. Then boil for half an hour, adding the following spices to every 100 lbs. of liver sausage:—7 ozs. salt, 1 oz. ground marjoram, ½ oz. ground sage, ½ oz. ground basil, ½ oz. ground thyme, 2 ozs. ground pepper. Several onions or a small amount of garlic may be added if liked.

To increase the amount of liver sausage, veal from the head and kidneys may be used. Stuff with stuffer into narrow hog casings twelve to eighteen inches long, not filling very full, tying the ends with twine.

Sometimes rounds are used, but are hardly strong enough. When filled and tied, they are cooked in water just below the boiling point for thirty minutes, to give the white appearance, continually stirring them. Care should be taken to prick the air places, or they will fill with fat, spoiling the appearance of the sausage. After cooling they may be hung in the open air for two or three days, and then smoked for six days over a slow fire.

Liver Sausage (Sardine).—Use 40 lbs. boiled pigs' livers (clean them from all veins and fibre), 7½ lbs. sardines (washed clean, boned, and tails cut off), 15 lbs. cooked veal, 7½ lbs. cooked lean pork, 20 lbs. cooked fat pork, 10 lbs. raw fat pork. Chop together very fine, and add—

14 ozs. salt.
10 ,, white pepper (ground).
1 ,, thyme ,,
1 ,, marjoram ,,

Stuff into beef middles. Cook and smoke the same as plain liver sausage.

Liver Sausage (Truffled).—Take 5 lbs. pigs' liver and 3 lbs. fat pork. Mince these two together very fine, and add about ¼ lb. good truffles cut into narrow strips. Add some pepper and salt and knead together. Fill into narrow pig's casings, and simmer for about half an hour. Wash well in cold water and hang up to dry; and if to be kept any time, smoke for a day.

Wine is sometimes used in which to cook the truffles. Care must be taken not to add any spices, otherwise the flavour of the truffles will be spoiled.

Liver Sausage (Strasburg Truffles and Goose).—(German Recipé).—This sausage does not keep long, so 10 lbs. is enough to make at a time.

Take 2 lbs. of white calves' liver, stew it for a little in hot water. Cut it in thin slices, and chop it up a little. Add to it 8 lbs. of pork—the neck or breast piece of a firm young pig. Take half fat and half lean, and mince both very fine, Next add four eschalots which have been fried in fresh butter a bright yellow colour. Add 5 oz. salt, ½ oz. white pepper, ⅕ oz. white ginger, ⅕ oz. mace. These sausages, being of a fine class, should not be seasoned too high.

Then cut from a fine red salted tongue ½ lb., and cut them into dice the size of peppercorns, add 2 oz. of Perigord truffles; also cut into morsels the size of peppercorns. Now mix well and put them into the stuffer very tightly, filling them into very wide fresh pig-skins not more than 12 inches long. Boil them three-quarters of an hour or an hour; boil them in clear water in which no other sausage, such as blood sausage, has been boiled in. After they are ready, throw them into cold water, changing the water often in order to keep the juice in the sausage and make them beautifully white.

Liver Sausage (Goose).—Goose liver sausage is the same mixture as for the truffles, only the pieces must be cut into bits the size of small nuts, and then to 10 lbs. of the mixture take 5 lbs. of goose-liver, which is *not* to be mixed with the other meat; but first put a narrow layer of cut goose-liver, then a layer of truffle meat, and so on time about until both meats are used. Then make into balls, and put them carefully into the machine for filling. Put this in very wide skins, and do not press the liver in filling.

It is simpler to make truffles and goose-liver sausage at one time. Cook the latter after filling in the same manner as the former.

Live Stock and Meat Imports (United Kingdom).—As compared with the immediately preceding year, it may be observed that the imports of live cattle and sheep in 1899 were in some degree reduced. The imported cattle, at 503,504 head, were less than in any year since 1895, and about equal in number to the supplies of 1891 and 1892. With the exception of the usual number of Channel Island imports, the trade is now wholly a Transatlantic one, four-fifths of the shipments coming from the United States and Canada alone. Of sheep we received 607,755 head, or nearly 9 per cent. less than in 1898. The live sheep trade, like that of cattle, is now confined to exports from the New World.

The reduction in the receipts of live animals was more than counter-balanced by the growth of dead meat imports. According to the estimated weights of the live cattle and sheep imported for food, the total supplies of this class may be taken to have represented 185,000 tons, compared with 209,000 tons in 1898, but the aggregate imports of fresh beef or mutton which had reached 320,000 tons in the immediately preceding twelve months, increased in 1899 to 362,000 tons, or nearly a thousand tons per day.

Beyond the frozen or chilled meat included in the category just referred to, the sea-borne portion of the meat consumed in the United Kingdom includes the various preserved and salted forms of meat and the large total of pork, bacon, and hams of foreign or colonial origin required for our ever-augmenting population. These items add to the total of fresh meat imports a further 502,000 tons, bringing the latest aggregate of imported dead meat to 864,000 tons, a figure which represents more than four and a half times the extent of our live imports at the present time.

The details of the returns are as follows:—

Cattle, -	503,504	Valued at £9,515,012
Sheep, -	607,755	
Pigs, -	2	
	Cwts.	
Fresh beef,	3,802,622	Valued at £31,999,141.
Salted ,,	178,183	
Preserved ,,	366,319	
Fresh mutton,	3,446,022	
Preserved ,,	87,327	
Fresh pork,	668,972	
Salted ,,	284,720	
Bacon, -	5,804,583	
Hams, -	1,978,621	
Unenumerated,	663,560	

Live Stock in Queensland.—see Queensland.

Live Stock in Foreign Countries.—From the Agricultural Returns Report for 1899, the statement of live stock in foreign countries is taken as follows:—

The comparative data respecting the numbers of horses, cattle, sheep, and swine in different countries, have also been re-cast in form, although here, as elsewhere, in dealing with the statements received from abroad, numerous cases in which information for recent years is absent have again to be deplored, while caution has always to be used in instituting a very close comparison between statistics collected in various ways, under definations not always strictly akin to our own, and often at widely distant intervals.

Thus, only for France and the United States, where an annual census of live stock is taken, and for Denmark, where the periodic inquiry happened to fall in that year, can details as recent as those for 1898 be furnished for comparison with those available in this country and her principal colonies. A comparison for 1897 enables the numbers of the live stock in Germany, Holland, India, Sweden, and Uruguay to be added, but for other States it is still necessary to have recourse in five instances to the data for 1896, and in ten other cases to utilise the results of inquiries stretching back over dates ranging from 1895 to 1888. The Russian live stock figures are apparently farthest in arrear, none being published for any later year than that last named.

So far, therefore, as the most recent movements in the numbers of live stock are concerned, these comparative tables enable a close contrast to be drawn with only a limited number of countries. While a certain increase has been recently occurring in the cattle of the United Kingdom, this has been accompanied by a further decrease in the United States, bringing their total herds 9,000,000 under the total of 1893. There is shown also the material decrease of 48 per cent. in a single year at the Cape of Good Hope, and a small decline in Australasia. Although the recovery noted last year is continued in the flocks of the United States, this is much more than balanced by a further loss of 3,000,000 sheep in Australia, with a considerable diminution at the Cape, and small reductions alike in the flocks of France and in those of Canada.

Four very typical countries with herds of cattle which in each case exceed ten million head, now supply annual statistics coming down to 1898, and the comparison of their most recent data with the mean number of stock maintained over the whole preceding decade, 1886–95, succinctly indicates the varying influences at work.

Period.	United Kingdom.	France.	United States	Australasia.
	No.	No.	No.	No.
Average 1886-95	10,900,000	13,300,000	51,200,000	11,000,000
Single year 1896	10,900,000	13,300,000	46,500,000	12,700,000
Single year 1897	11,000,000	13,500,000	45,100,000	12,200,000
Single year 1898	11,100,000	13,400,000	44,000,000	11,600,000

The relative increase thus shown to be maintained in the herds of the United Kingdom is the more satisfactory when it is remembered that the cattle of this country are now more numerous in proportion to area than any in Europe, the much smaller total herds of Holland, Belgium, and Denmark only excepted. A recent calculation shows 144 head of cattle to every 1,000 acres of measured surface in the United Kingdom, a proportion which is greater by 23 per cent. than was recorded thirty years before. In Holland and in Belgium, 197 and 195 head of stock per 1,000 acres are returned; but the increase in a similar period has been less rapid than our own, or from 13 to 14 per cent. In Denmark, on the other hand, the stock of cattle has augmented by over 40 per cent. since 1870, and now works out to 186 per 1,000 acres.

A similar table to that given for cattle may be constructed for the sheep of the same four States whence annual statistics are supplied.

Period.	United Kingdom.	France.	United States	Australasia.
	No.	No.	No.	No.
Average 1886-95	30,700,000	21,800,000	43,700,000	109,200,000
Single year 1896	30,900,000	21,200,000	36,800,000	110,500,000
Single year 1897	30,600,000	21,400,000	37,700,000	103,500,000
Single year 1898	31,100,000	21,300,000	39,100,000	100,500,000

These figures emphasise the relative predominance which sheep farming still holds in the agriculture of the United Kingdom, where as many as 400 sheep per 1,000 acres of total surface are still maintained. In the East of Europe, according to the last returns, Bulgaria and Servia follow with flocks of 290 and 359 respectively, on a similar area. France, however, has only 164, Roumania 155, Denmark 115, Spain 107, and Hungary 102 per 1,000 acres of surface, and other European States fall below these ratios.

Live Stock Returns (United Kingdom).—The Report of the Board of Agriculture for 1900 gives the following information relating to the returns for 1899.

The returns of live stock in 1899 were on the whole satisfactory, cattle, sheep, and pigs all showing a distinct increase, while in the case of horses there was practically no change, the total being only 530 below that of the preceding year.

The slight net decrease in the number of horses in Great Britain was accompanied by movements which, regarded in detail, are not unsatisfactory. The diminution in the number

of unbroken horses less than one year old, returned in 1897 and 1898, necessarily left its mark in the group of those of one year old and above. But in 1899, there is once again reported an increase of 3,644 in the younger section, and of more than 10,000 in the main class of horses used for agriculture including mares kept for breeding.

The total number of cattle in Great Britain showed an increase of 173,000, or 2·6 per cent. on the year, and this result was achieved notwithstanding that Scotland by itself showed a decrease on the year before. Every county in England and Wales—London and Middlesex only excepted—contributed to the larger stocks of 1899. The greatest advance occurred in cattle under one year, which were augmented by 87,000, or 6·6 per cent., and this increase was again, as in 1898, chiefly noticeable in the English and Welsh breeding counties—Devon, Shropshire, Cornwall, Somerset, the West Riding of Yorkshire, and Hereford, being among the highest in the list. The same remarks apply generally in the case of cows and heifers in milk or in calf, which showed a total increase of 84,000, or a gain of 3·2 per cent. on the year.

The following table exhibits the progress which has been made, both absolutely and relatively, in regard to the population, in the numbers of horned stock of Great Britain in the past five years.

Year.	Population of Great Britain.	Cows and Heifers in Milk or in Calf.	Other Cattle.	Proportion of Cows to 1000 persons.	Proportion of other Cattle to 1000 persons.
	No.	No.	No.	No.	No.
1895	34,538,701	2,486,000	3,868,000	72	112
1896	34,904,204	2,512,000	3,982,000	72	114
1897	35,273,634	2,532,000	3,968,000	72	112
1898	35,647,024	2,587,000	4,035,000	73	113
1899	36,024,438	2,671,000	4,125,000	74	115

A similar gain in breeding stock is told by the returns for sheep. The net increase of the flocks of Great Britain was 496,000, or 1·9 per cent., and it would have been greater but for a decrease of 163,000 in the number of the older sheep other than breeding ewes, the addition to the number of ewes kept for breeding being 323,000, and to the number of lambs 336,000, in both cases increases of 3·2 per cent. The augmentation of the ewe flock was general, although the Scottish share was the least. In the case of sheep under one year, the increase was confined to England and Wales North of the Tweed, local additions in various counties amounting in Aberdeenshire to nearly 7,000, and in Shetland to nearly 5,000, were more than counterbalanced by the heavy reductions in a few counties, headed by Argyleshire, which recorded a falling off of nearly 22,000 lambs. Considerable progress has nevertheless been made in recent years towards a replenishment of the sheepfolds of Great Britain as a whole, and this is particularly noticeable in the increase of the ewe flock, as shown in the serial table below:—

Year.	Ewes kept for Breeding.	Other Sheep of One Year and above.	Total of Ewes and Sheep One Year Old and above.	Lambs.	Total of Sheep and Lambs.
1895	9,663,000	6,334,000	15,997,000	9,795,000	25,792,000
1896	9,926,000	6,428,000	16,354,000	10,352,000	26,706,000
1897	10,007,000	6,219,000	16,226,000	10,115,000	26,341,000
1898	10,138,000	6,204,000	16,342,000	10,401,000	26,743,000
1899	10,461,000	6,041.000	16,502,000	10,737,000	27,239,000

The number of pigs increased on the year by 7 per cent., the total returned on the 5th of June in Great Britain being thus considerably larger than in the two preceding years, although this class of stock is not yet restored to the numbers returned in 1895 and 1896. The following table shows the five years' movement:—

Year.	Sows kept for Breeding.	Other Pigs.	Total Pigs.
1895	415,000	2,469,000	2,884,000
1896	394,000	2,485,000	2,879,000
1897	334,000	2,008,000	2,342,000
1898	362,000	2,089,000	2,451,000
1899	376,000	2,248,000	2,624,000

The figures for 1899 for the United Kingdom, including Isle of Man and Channel Islands, give the total stock as follows:—

Cows and heifers in milk or in calf -	4,133,249
Other cattle—two years and above -	2,357,207
,, ,, —one year and under two	2,391,250
,, ,, —under one year - -	2,462,990
Sheep - - - - - - -	31,680,225
Pigs - - - - - - -	4,003,589

The average prices for 1899 of fat cattle per cwt. (live weight) at the undermentioned places in England and Scotland, are compiled from the returns received under the Markets' and Fairs' (weighing of cattle) Act.

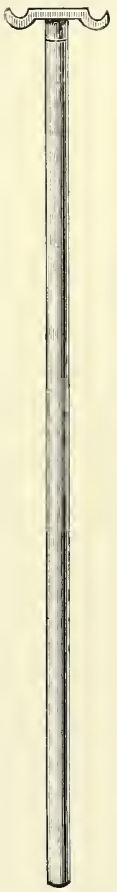
	1st Quality.	2nd Quality.	3rd Quality.
Carlisle - -	34/6	30/8	26/10
Leeds - - -	32/2	28/10	28/
Liverpool - -	33/6	30/	24/6
London - -	38/	33/8	26/4
Newcastle - -	36/2	32/8	28/4
Shrewsbury - -	34/10	31/2	28/2
Aberdeen - -	36/10	33/2	25/4
Dundee - -	35/2	32/10	26/4
Edinburgh - -	36/6	34/6	30/
Falkirk - - -	35/2	33/2	29/4
Glasgow - -	35/4	33/	31/8
Perth - - -	35/6	33/	30/2

Live Stock Weighing Machines.—see Weighing Machines.

Locomotive Type Boilers.—see Steam Boilers.

Logwood.—Used for neutralising the brown colour of black puddings and making them of a darker shade. It is now to some extent superseded by aniline black dyes. It is the solid heart wood of the *hæmatoxylon campechianum* of the family of the *leguminosæ*, and is a native of Mexico and Central America. For black puddings a little of the powder is mixed with the boiling water. The purple colour of the dye and the brown of the sausage give, when proper proportions of the former are used, a fairly deep black colour.

London Markets, Meat Supplies.—see Meat Supplies.

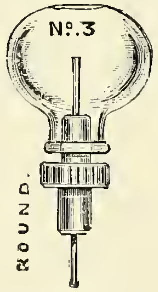

Long Arm.

Long Arm.—A pole on the top of which is fixed a gambrel shaped head for lifting and taking down joints and other pieces of meat to and from the rails in a shop. The usual lengths made are 5 ft., 6 ft., 7 ft., and 8 ft.

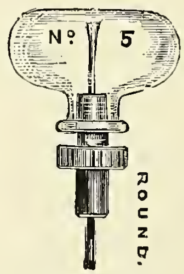
Lowry Pig Scraper.—see Pig Scrapers.

Lubricator.—An instrument for the supply of oil or grease to a bearing or working part, to reduce friction on same. There are several kinds of lubricators. A very efficient and simple arrangement, however, consists of a reservoir with a small tube in the centre; a piece of twisted copper wire with some worsted attached, is inserted into the tube and the oil from the reservoir is syphoned to the working part.

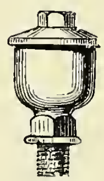
Sight-feeding lubricators are used for engine cylinders for charging the steam with greasy matter—the difference depended on for efficiency being the specific gravity of water as compared with oil. A sight-feed lubricator consists of a brass cylinder containing in the top a chamber and cock, into which the oil is filled, and in the bottom two valves—one communicating with the steam chest downwards, and with a small tube of brass reaching upwards nearly to the top of the interior of the brass cylinder, and the other leading direct from the steam chest into the bottom of the brass cylinder. When oil is put in, the first valve is opened, steam rushes up through the tube, condenses and forms water which falls to the bottom, while the oil floats on the surface. A glass index gauge is affixed to the outside indicating the height of the fluid.



Glass Lubricator, Ball Shape.



Glass Lubricator, Flat Top.


Gun Metal Lubricator.

Lubricators for solid oil are made of iron or gun metal with a screw top. As the oil is required for the bearing, the attendant simply gives the top a turn and thus presses the oil down through the tube running to the working part.

Luminous Meat.—After having been kept rather too long, the surface of raw meat sometimes acquires an appearance of slight luminosity in the dark, which is due to the development in it of a bacteria (*bacterium phosphorescens*). This microbe is not itself of an injurious character, nor does it, when cultivated in broth, give rise to any poisonous products. When putrefaction—due to perfectly distinct micro organisms—has not set in, luminous meat may be cooked and eaten with perfect safety. It must be remembered, however, that the exposure to the air which is sufficient to infect with the *bacterium phosphorescens* proves also, in very many cases, enough for the development of different septic forms of life. The *bacterium phosphorescens*, therefore shines, to signal the initiation of a doubtful dangerous state; and it should be added, disappears with the onset of pronounced decomposition.

Luncheon Sausage.—see German Sausage.

Lung Blood Sausage.—Lung blood sausage differs from the common blood sausage, in that the pig's lung and liver is sifted with the blood, is mixed and used just as if it were nothing but blood. It is presumed that the amount of meat is increased to counter-balance the amount of lung or liver used in the blood. Of course the spices must be increased also. Lung blood sausage has the advantage of the common blood sausage in that it keeps a better flavour and will not dry up so quickly.—see also Blood Sausage.

Lyons Sausage. — (German Recipé). — The Lyons Sausage (Saucisse de Lyon) was introduced into Germany in the year 1852 by Lill on his return from his tour in France. Sausage-makers throughout Germany then tried to make it, because of his success with it, but no one else succeeded. It can only be manufactured to keep by taking the greatest of care. When it is well made and well dried, it would pass for Cervelat Sausage.

It is prepared in the following manner:—

For a quantity of 40 lbs. take

25 lbs. fed pork.
10 ,, beef from a young bullock, which should be chopped up when warm and then pounded in a mortar.
5 ,, pork fat, cut into dice the size of peas, and then cooked for a little in boiling water.
12 oz. salt. 2 oz. Indian cane sugar.
1 ,, pulverised saltpetre.

Mix the two lean meats, then mix the salt, saltpetre, and sugar together. Rub them into the meats, and let it stand for forty-eight hours in a cool room in summer, in a warm room in winter. Now chop up the meat fine, then mix the seasonings and add them. They are, 2 oz. white pepper, $\frac{1}{2}$ oz. white ginger, $\frac{1}{2}$ oz. grated nutmeg, two eschalots, salted and finely grated.

Before the pork fat is put amongst the rest, the spices should be well mixed up amongst the other things and a little water worked into the mass. Now put in the fat in the little dice-shaped pieces. Mix it in quickly and lightly; being careful that the pieces of fat do not lose their shape. Put the meat into medium-wide bullocks' runners, 15 inches long, pressing it in very tight. Now *dry* the sausages *well* before smoking. When they are smoked a fine red colour, put them at once into a pot, and cook for half-an-hour at a heat of 203° Fahr.

When the sausages are cool, there are usually some wrinkles in the skins. This can be remedied by putting the sausages in pairs into boiling water not more than fifteen seconds. After they cool again, they should be smoked in cold smoke, six to eight hours: they are then ready. They are usually sold at 1s. per lb.

MACE.—The reticulated arillus which covers the shell of the nutmeg. Like nutmegs, it contains a pleasant oil, and is in great request for sweetening and flavouring various kinds of dishes.—see Nutmegs and Mace.

Maple Skewers.—There are now a large quantity of maple skewers used, they come cheaper than those made from hickory, and the wood, both in Canada and the United States of America, is plentiful. It is possible to finish maple skewers with a smoother surface, as the grain of the wood is much shorter than hickory. There are two varieties of maple skewers on the market—the knife-edged and round. The former is made exclusively in Canada, while the latter is manufactured in Canada, America, and on the Continent of Europe. It is claimed for the knife-edged skewer that it enters the meat more freely than any other, but as a matter of fact the round skewer is the favourite with users. The sizes of maple skewers follow the standard sizes made of hickory, but it is safer to use a stouter make in maple as they are liable to break more easily.

Margarine Imports.—see Dairy Produce Imports.

Marjoram —see Culinary Herbs.

Market Meat Weighing Machine.—see Weighing Machine.

Maximum and Minimum Thermometers. — see Thermometers.

Mayence Red Sausage.—This is an easily made sausage; it is very tasty, and in great request in the Mayence district.

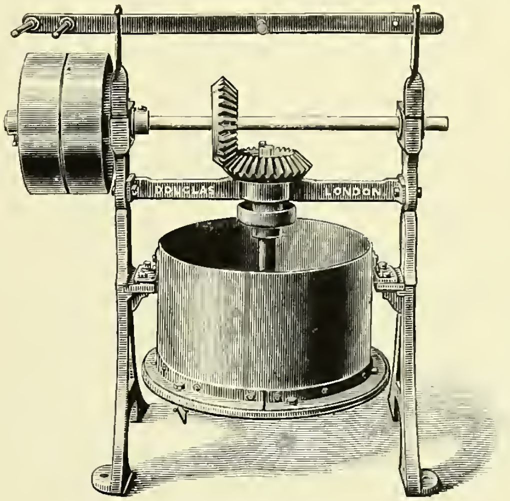
Cut neck of pork with the rind on into long thin pieces. Take 10 lbs. of these strips; chop finely 3 lbs. of pigs' rind, mix the two together and season with 7 oz. salt, $\frac{1}{2}$ oz. white pepper, $\frac{1}{2}$ oz. peppermint, $\frac{1}{3}$ oz. ground cloves, $\frac{1}{3}$ oz. marjoram, $\frac{1}{3}$ oz. mace. Work all well together, then add enough pigs' blood to colour the whole well. Fill into pigs' stomachs, and put *at once* into water boiling hard, and stir slowly for a quarter of an hour, in order that the blood does not run to one side of the sausage. They have been long enough boiled when, on trying them with a fork in the thickest part of the sausage, no blood exudes, but only quite white fat.

Sometimes pigs' tongue is cut into strips, and also mixed among the rest, and even the snout and ears may be used in this manner.

Measures.—see Weights and Measures.

Meat Brushing Machine.—In factories where fine meat pastes are made, it has been found impossible to get meat or fish paste fine enough with mere cutting machinery. Meat paste especially, is demanded in a perfectly impalpable condition; hence the use of the meat brushing machine.

It consists of a cylinder at the bottom of which is a grating; on the top of this grating is placed fine sieves of whatever mesh is found most suitable for the substance to be treated. Two brushes are fixed on a cross arm which is fixed so that the brushes just touch the sieves and at right angles to the axis of the vertical spindle. This vertical spindle is revolved by means of a horizontal shaft and mitre gear, which is connected up by belt to an ordinary driving shaft. A slow speed is what is wanted—something like fifty revolutions per minute. The meat, fish, or other material, is first of all cut in another machine such as an "Alexander" machine or a "Silent" machine. It is cut as fine as possible and then put into the cylinder of the meat brushing machine



Meat Brushing Machine.

in small quantities. The brushes, as they revolve, press the paste through the sieve that happens to be in for the time being, and the paste falls into a dish placed to receive it beneath the machine. The brushing is continued until all the material is rubbed through.

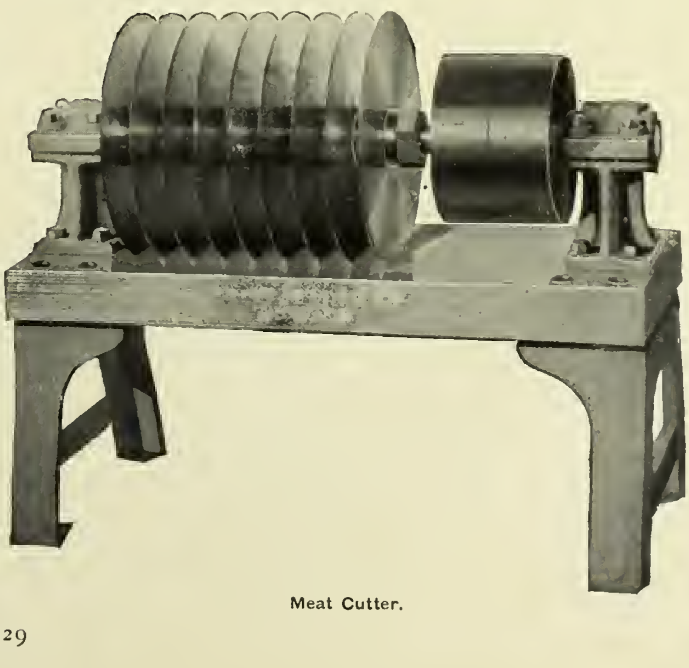
Meat Cutters.—see Alexander Meat Cutters; Brawn Meat Cutter; Silent Meat Cutters.

Meat Imports.—see Live Stock and Meat Imports.

Meat Inspection, U.S.A.—see Inspection of Meat, U.S.A.

Meat Cheese.—see Lausaune Meat Cheese.

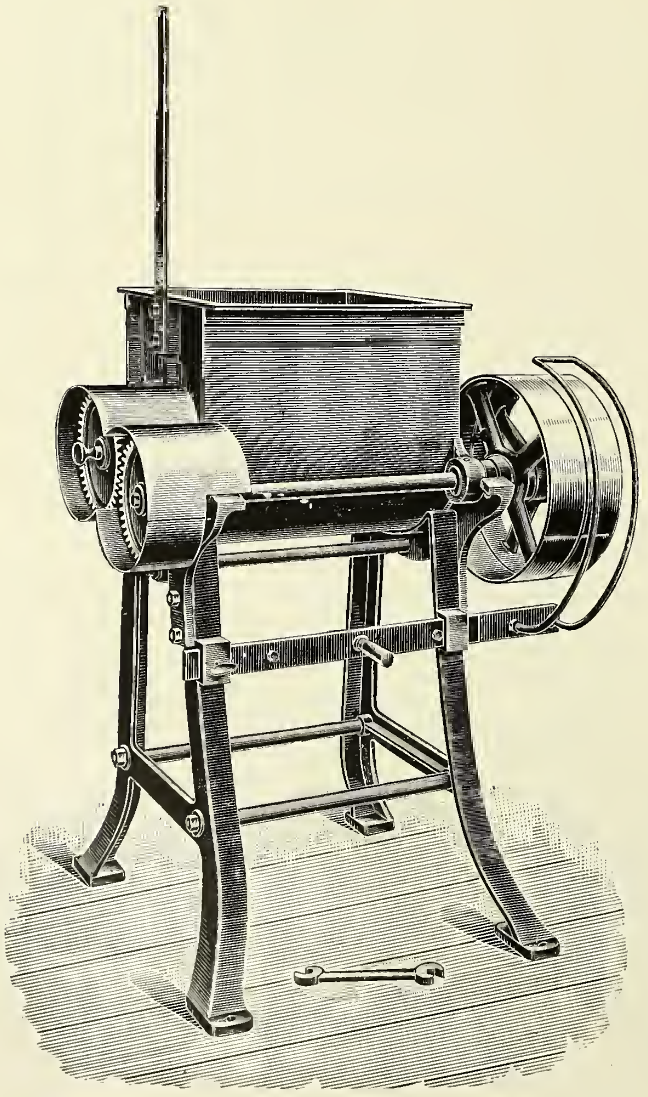
Meat Clip.—see "Whee-gee" Clip.



Meat Cutter.

Meat Cutter (for Strips).—A machine with a series of disc knives for cutting meat into strips for canning. The meat can be fed in any quantity, and the machine cuts it as fast as it is thrown into the hopper. The object in cutting the meat in this way is to facilitate handling in the canning department, as after being cooked, it readily breaks into the sizes required for stuffing into the tins. Our illustration shows the knives exposed and gives an accurate idea of how the machine works.

Meat Mixer.—The use of a mechanical mixer for meat is hardly understood in the United Kingdom. Any mixing of meat, dough, vegetables, blood pudding mixture, etc., is, to a large extent, performed by hand. This is altogether a mistake, inasmuch as the heat of the hands is quite sufficient to set up fermentation, and consequently start taint or putrification. Much of the meat, sausages, and pie meat that go bad, do so from this cause. A mechanical mixture then becomes a necessity and the design shown is perhaps as good as any other.



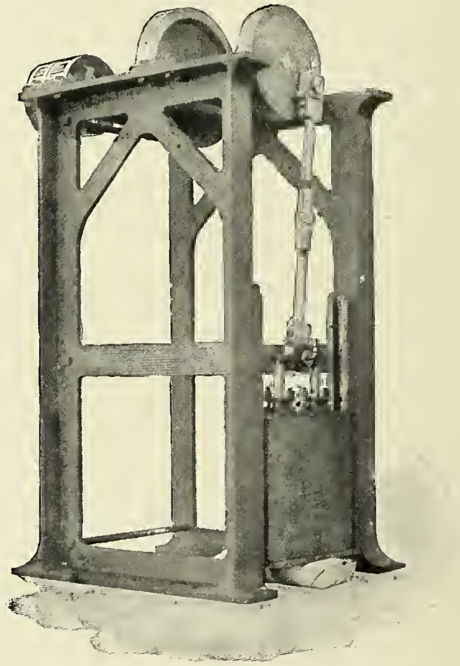
Meat Mixer for Power.

The holding capacity of the machine may be varied by increasing or diminishing the dimensions. The mixer consists of a rounded tank which is made to tilt over and through which is driven arms whose faces travel in the direction of a spiral, and if united, would form a spiral. One half of the arms travel in one direction, and the other in the opposite direction—perfect mixing being the result, and without increase of temperature.

Meat Press.—see Box Press.

Meat Prices.—see Averages Prices of Dead Meat in London.

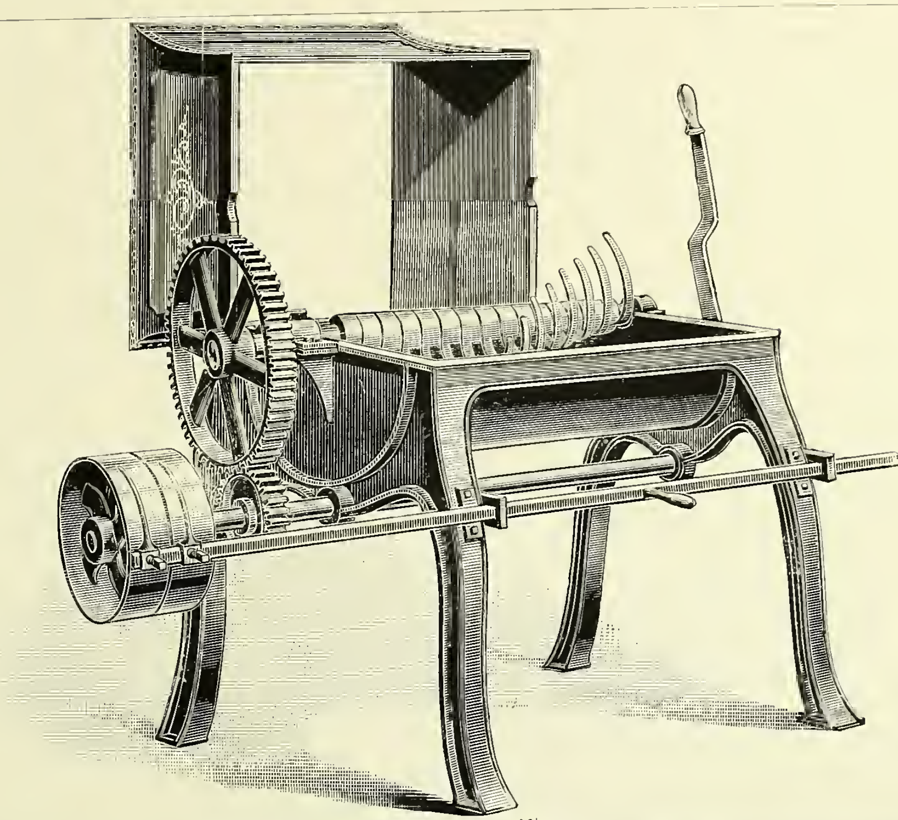
Meat Pounder.—A machine used largely in the United States of America for flattening bellies to give them a good shape. It does not strike a hard blow, but just sufficient impact to do the required work without destroying the fibre of the meat. Springs are inserted in the pounder to properly regulate the blow. The bellies are simply pushed underneath the pounder, and after being pounded are taken out and trimmed.



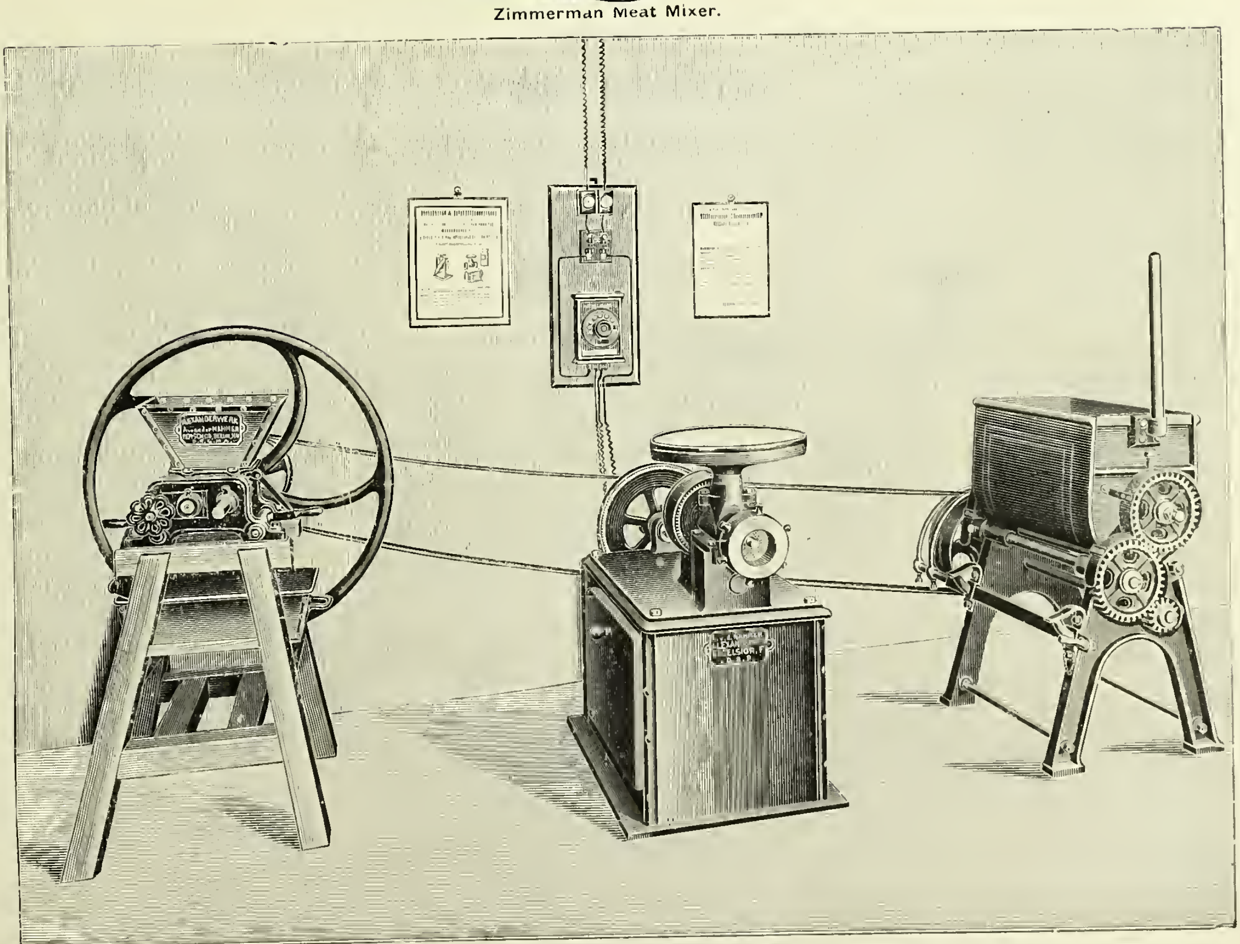
Meat Pounder.

The proper speed to drive the machine is 150 revolutions per minute, and one horse-power is required to drive it. It should be mounted on a hard block, so as to give both a firm foundation and a proper surface for laying the meat on.

Meat Sterilizers.—In some continental countries, notably Germany and Denmark, it is permissible for the slaughter-house authorities to dispose of seized meat after it has been cooked at a very high temperature. Tuberculous meat for example, which may not be considered very dangerous, if cooked in a meat "sterilizer," can be sold to the public. No doubt this precautionary measure of cooking the meat under the eyes of the authorities is productive of good. The poorer people particularly are protected against unscrupulous traders.



Zimmerman Meat Mixer.



Combination of Alexander Meat Cutter and Electric Motor, with belt connections to Meat Mixer and Corn Bruiser.

The meat so cooked is sold in a shop provided in German abattoirs and designated the "Freibank." Here anyone may come and purchase meat which has been cooked, so as to destroy all germs of disease.

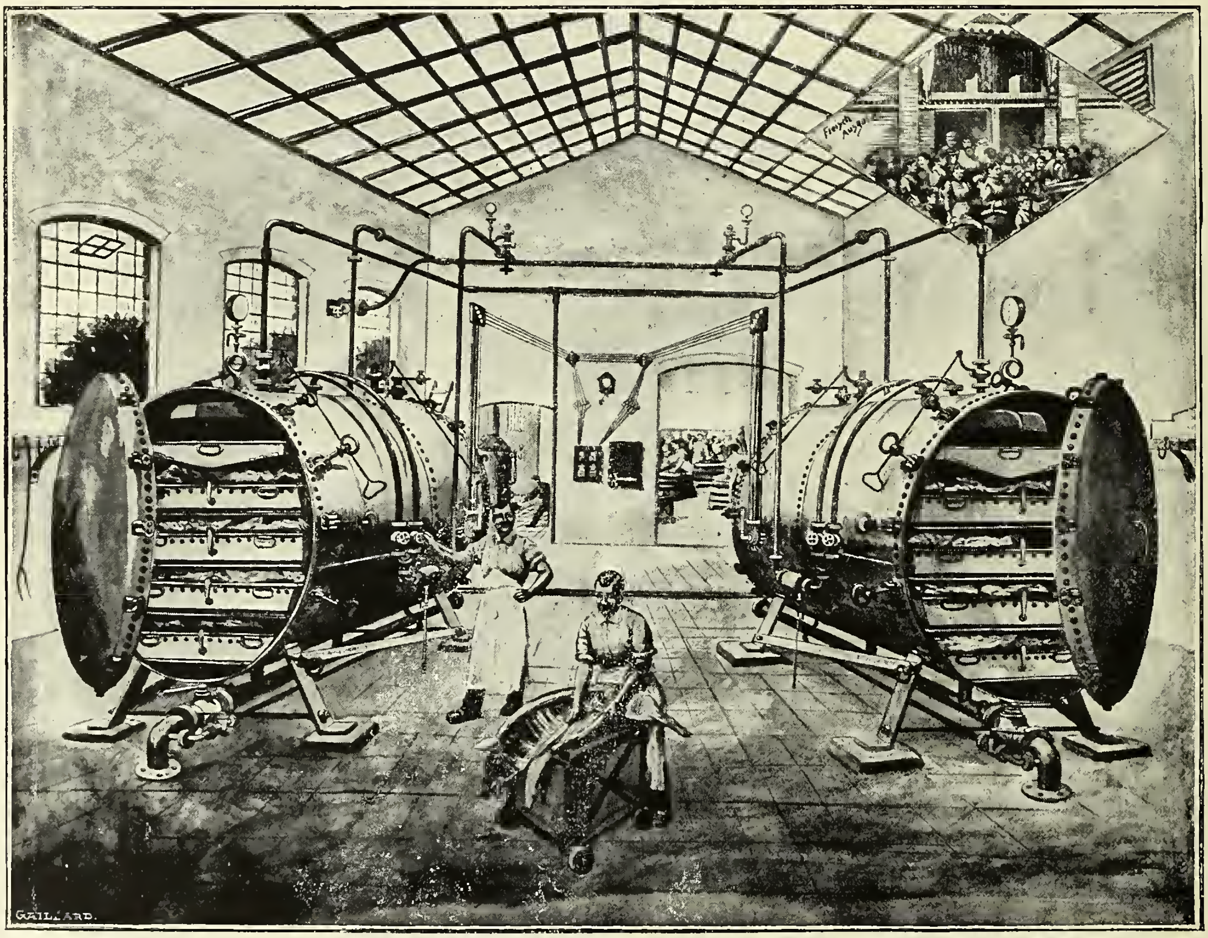
The institution is a good one and worthy of imitation.

There are several processes by which this cooking can be accomplished. Two are of particular interest, viz., those of Hartmann and Rohrbeck.

Dr Rohrbeck's Apparatus for the Cooking of Partially Diseased or Suspected Meat.—The Patentee's own description.—Experiments in cooking by steam with Rohrbeck's disinfector in the Central Slaughter-house, Berlin.—During the Exhibition of the International Medical Congress which was held in 1890, Dr Hermann Rohrbeck exhibited a new disinfector, which was also designed for cooking by means of steam. This apparatus having excited the attention of Dr Hertwig, director for the official inspection and examination of meat in the public slaughter-house in Berlin, that gentleman obtained permission from the proper authorities to have it placed in the central slaughter-house, in order to have it thoroughly tested.

This disinfector consists of a double-walled iron cylinder, 2·62 metres long, and 1·68 metres in diameter. It has two doors (see illustration) of iron, which can be hermetically closed by means of screws. In the interior of the apparatus are movable iron grates, arranged in tiers one above the other, upon which the pieces of meat, etc., are put. Under each grate is a zinc dripping-pan which receives the gravy and fat from the meat, and conveys them into a large zinc vessel placed at the bottom of the apparatus for that purpose.

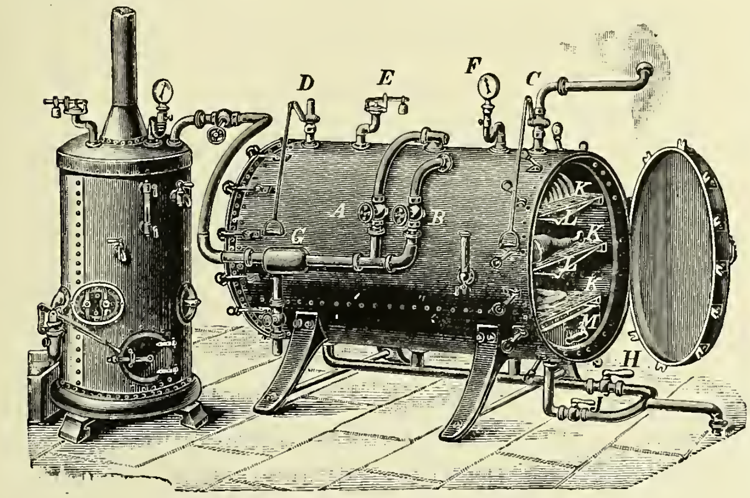
The apparatus was connected with the steam boiler in the slaughter-house, in which boiler there was generally a steam pressure of from 2 to 2·5 atmospheres. The disinfector is built for a pressure of one atmosphere, but, as a rule, these experiments were made with half an atmosphere; occasionally, but only for a short time, with three-quarters of an atmosphere.



General View showing two large Rohrbeck's Sterilisers at work.

The steam enters from above, and can be conducted, according as may be desired, either direct from the boiler, or first through the double walls of the apparatus into the air. When the steaming process is at an end, the apparatus can be made to work as a drying room by means of a special valve, which causes the steam to circulate between the double walls (this is only necessary when the apparatus is used for other disinfecting purposes). The steam escapes from the bottom of the boiler through several openings, which lead into the waste pipe.

One peculiarity of Rohrbeck's apparatus is a cooling arrangement which, by means of cold water produces



Rohrbeck's Meat Steriliser—General Arrangement.

condensation of the steam, and a negative pressure in the boiler, which pressure is indicated by the manometer. The object of this condensation is to obtain absolutely saturated steam. Besides this, however, it has been proved by experiments, that repeatedly condensing the steam causes differences of pressures, which are most favourable to quick and efficacious cooking.

The apparatus is very easy to manage. Small objects not affording sufficient scope to give a reliable proof of the capacity of this apparatus, the half of a bullock and some cwts. of liver, lights, etc., were reserved for each experiment by order of the director, Dr Hertwig.

The meat, before being laid upon the grates, was cut by a butcher, into pieces of about 12 to 15 centimetres thickness, and 3 to 6 kilos weight. Such cubes of meat as are mentioned in the experiments Nos. 5 to 8 could only be obtained by being cut from the legs of full grown bullocks. An incision was sometimes made in the liver and lights, but only when these were considerably enlarged by pathological process.

As soon as the meat was put upon the grates, a tested maximum thermometer was stuck into the middle of some specially selected pieces, while those pieces which were obviously difficult to steam were furnished with a contact thermometer, which latter — as soon as a temperature of 100° C. was reached—signalled the fact by setting in motion a bell placed on the outside of the apparatus. The conducting wires fastened to the thermometers were connected with cable wires, which, being passed through the walls of the apparatus, communicated with an electric battery and the numbered signal bells. In this manner it could immediately be ascertained when the temperature in the centre of certain pieces of meat had reached 100° C. In order to control the highest temperature in the boiler itself, a tested maximum thermometer was also hung up there.

These experiments regarding the penetration of heat into the meat yielded very interesting results, a brief account of which is given here.

In making the experiments, beef of different quality, and taken from different parts of the animal, was made use of, and it was found that quite lean beef is the hardest to be thoroughly cooked. Of course such pieces of meat as were used in some of the experiments will scarcely ever be met with in the market, but even in *these* there was a temperature of 100° C. in the interior, after about 2½ hours' steaming. On the other hand joints of meat such as are usually seen in the market require to be steamed for a much shorter time.

On looking through the general results there may, perhaps, appear to be some contradictions in reference to the time necessary for thoroughly cooking the single pieces of meat. This, however, is of small importance, because these experiments—made on a large scale—were influenced not only by the fluctuating supply of steam inevitable in a large establishment, but also by the different condition of the meat at disposal.

Dr Pistor (Geh. Medicinal-Rath), Dr Wolf (Veterinary Surgeon), and other competent authorities who witnessed these experiments, declared the meat cooked in Rohrbeck's apparatus to be *perfectly well done, and very juicy. It looked very nice, and tasted and smelt better than meat boiled in water. The soup, too, was all that could be desired.*

The liver and lights which were steamed at the same time were also thoroughly done, in fact they—still warm—fell to pieces in one's hands.

Dr Wernicke (Königl. Stabsarzt), who, as was presumed, witnessed one of these experiments at the request of Professor R. Koch, in order to make bacteriological investigations with steamed tuberculous flesh, abandoned his project as unnecessary after seeing such results.

Guinea pigs vaccinated with tuberculous material which had been *steamed* remained perfectly healthy, while others, which were vaccinated with the same material in a *raw state* were found, on being dissected, to be full of tubercles.

The foregoing proves that Rohrbeck's disinfector is of immense importance for slaughter-houses, viz. :—

1. As a cooking apparatus for such meat as may well be used for food, but which, in its raw state, is forbidden to be sold, and must, therefore, be thrown away, because the usual mode of cookery in our kitchens does not suffice to effectually destroy the germs of disease.

2. As a destructor for such animal substances as are positively unfit for human food. In this case the arrangement of the apparatus is somewhat different to that here described, as provision must be made for the extraction and preservation of fat, glue, etc.

The above mentioned experiments were undertaken by Dr Hertwig with the intention of replacing the stalls for condemned meat (Freibanks) by this process of cooking, the former being, for many reasons, unpractical for large towns.

Hartmann's Meat Steriliser for making Unmarketable Meat Palatable (Patentee's Description).

According to recent laws it is permissible to trade in such meat as, on account of the small number of microbes or parasites it contains, is "rejected," if it has previously been sterilised by a method under magisterial control, and thus made hygienically uninjurious. The sterilisation process must be so effected that the thickest pieces of meat have been subjected to a high enough temperature to kill all microbes, and yet the meat has not suffered in flavour or nourishing qualities. This disadvantage does not occur if steam at a temperature of over 100° C is used instead of water. Even here there is a technical difficulty, to wit, the exact regulation of the temperature of the steam. If the temperature is too high, then the meat breaks up and is black and ugly. By too

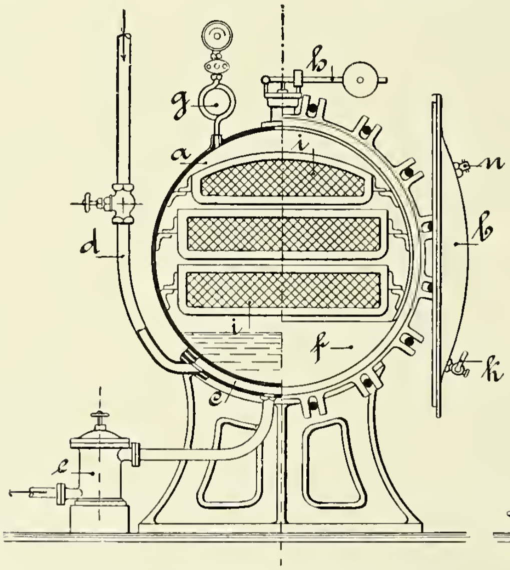
low a temperature the sterilisation process is very much prolonged, and the loss of weight in meat is very much increased.

A thoroughly rational sterilisation—that is, a certain making of the meat uninjurious with a simultaneous utilisation of every part of it—is thus effected, above all, by the exact regulation of the steam temperature, and by looking to the quality and sort of meat to be sterilised.

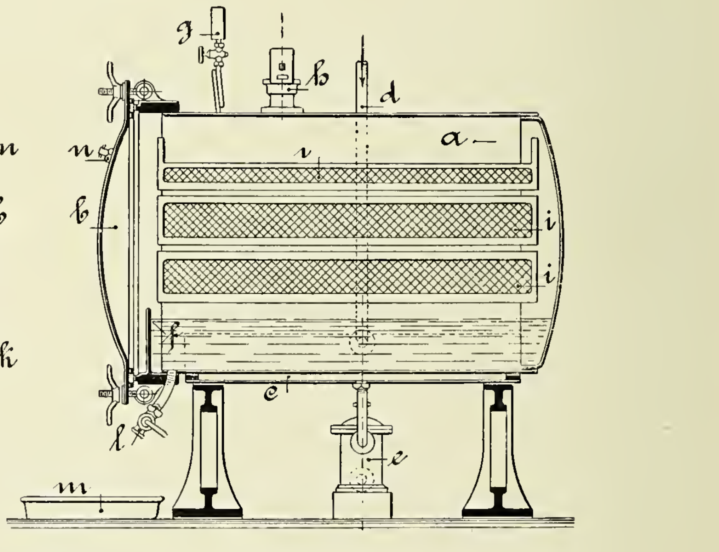
These conditions are thoroughly fulfilled by the Hartmann meat steriliser, in that the steam for driving the apparatus is not led direct into the cooking space from the steam boiler, as is the case with other apparatus, but instead, clean water is made into vapour by it indirectly, and in this steam the meat is sterilised. This indirect transmission of heat offers the double advantage of the exact regulation of the temperature, and also prevents the meat being sullied by any smuts, etc., brought in with the driving steam. The apparatus consists (as the accompanying illustrations, longitudinal and transverse, show) of a cylindrical vessel (*a*) with a tightly fitting cover (*b*) at the end. The lower part of the cylinder (*a*)

A characteristic arrangement of the cylinder (*a*) is the straight wall (*f*) in front, by which the lower part of the inner space is protected in front. This is a mould shaped tank, heated from underneath by the steam heating surface (*c*). Into this tank the water for vapourising is filled, high enough to cover the heating surface (*c*). The meat to be sterilised is then put into apparatus in the perforated baskets (*i*), and the cover (*b*) shut up. By opening the steam valve (*d*) the water inside is brought to the boil, and during this time the cock (*k*) is left open, so that the air escapes from inside and room is made for the steam. As soon as steam begins to escape from the cock (*k*), the apparatus is sufficiently void of air, whereupon the cock is again shut. After a short time the steam developed out of the water will take on pressure, which can be learned from the gauge (*g*).

As a rule, it is advisable to fix this pressure at half an atmosphere by the closing of the valve (*g*), whereby the temperature of the steam will be about 112° C.; but there is nothing to prevent the steam pressure being one atmosphere, equal to 121° C.



Cross Section.



Longitudinal Section.

Hartmann's Meat Steriliser.

has a heating jacket (*c*), which is fed by a steam pipe (*d*) with steam from the steam boiler. Condensed water is led into the steam jacket (*c*) by the automatically working apparatus (*e*). The importance of the remaining armature is explained by the lettering underneath the illustrations as follows:—

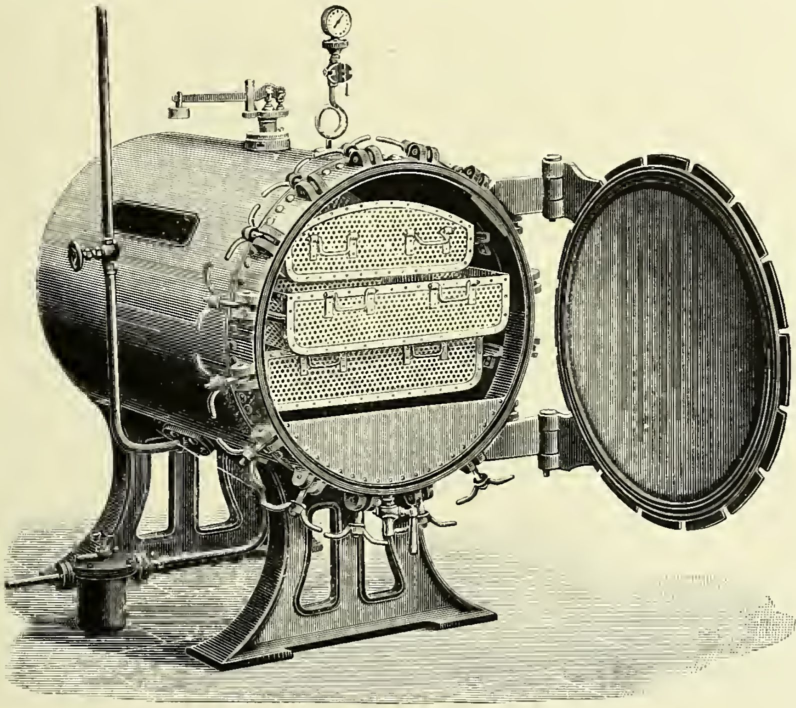
(*a*). Cylindrical steam vessel; (*b*). tightly closing door; (*c*). steam jacket below (*a*); (*d*). steam pipe towards this led from steam boiler; (*e*). apparatus for separation of condensed water; (*f*). straight "head wall" for the further shutting off of the water space; (*g*). gauge, showing the steam pressure in the sterilisation space; (*h*). safety valve, for letting off ½ atmosphere pressure in the sterilisation space; (*i*). perforated galvanised wire baskets for the reception of the meat; (*k*). cock for letting off air in the sterilisation space; (*l*). cock for running off the meat juice; (*m*). dripping pan, for water dropping out of (*k*) and (*l*); (*n*). locking screws for the connecting of the wires of the electric contact thermometer.

In this way the meat lying on the baskets (*i*) is quickly warmed into the very centre. The fat and gravy from this meat mix with the water and form a very palatable bouillon, which at the end of the process is either ladled out or led out through the cock (*l*). The sterilised meat is taken from the baskets (*i*) on the opening of the door (*b*), and can then be sold. The flavour and appearance of the meat differ in no way from that cooked in the usual way.

It is important that the pieces of meat to be put in the apparatus should be of an equal size if they are to be equally cooked. It is also advisable to sterilise only meat of the same kind and quality at the same time, or else to take out the fat or light pieces of meat before the heavier or leaner portions.

Control of Sterilisation.—It is important to see that in every case the largest pieces of meat attain a temperature of 100° C. This can be done in the simplest way by the electric thermometer, which, if put into the meat, shows the maximum temperature at the end of the process. If

this temperature is under 100°, then the time of the sterilisation period must be increased. This control can also be practised by means of an electric thermometer, which is laid into the meat, and sets a bell into action as soon as the temperature of 100° C. is reached. For the conducting of the electric wires through the cover of the apparatus, the clamping screws (*n*) will be suitable.



Hartmann's Meat Steriliser—General View.

The use of the electric thermometer offers this advantage over the maximum thermometer, that it lets one know the exact point of time at which sterilisation ensues, and the steaming process may be ended. It thus prevents the great loss of weight resulting from too long a steaming process.

Outfit.—The apparatus is made throughout of wrought iron, in solid boiler-made work, and rests on strong cast iron feet connected by staying rods. For protection against loss of heat, the cylinder is surrounded by a stout wrought iron protecting jacket. The meat baskets are made of wrought iron, and well tinned for purposes of cleanliness. The cocks and steam valves are made of bronze, and as far as possible polished bright. A special value is set on the easy cleaning of the boiler space. For this purpose all the rivet heads in the interior are sunk, so that by the rounding off of all the corners every opportunity is given to prevent uncleanliness.

The apparatus, before being sent into the market, is tested conscientiously in the sterilisation space to two atmospheres, and in the steam heating jacket to 7½ atmospheres. By this latter pressure it must be seen that the tension of the steam supplied must not be more than 5 atmospheres. If it is higher, then a special reducing valve must be inserted.

Advantages.—The great advantages of the Hartmann meat sterilisers may be tabulated as follows:—

1. Their entire construction in wrought iron, hence great safety in cooking.

2. Horizontal position of the sterilisation cylinder, therefore its easy working.

3. Indirect production of steam, therefore an exact regulation of the steam temperature, and prevention of the over heating of the meat, or fouling of the same by direct boiler steam.

4. Attainment of steam temperatures up to 121° C., thus a certain killing of all microbes.

5. Arrangement of an electric bell, which ensures exact control over the length of time for the reaching of the desired sterilisation temperature of 100° C.

Meat Supplies in the London Central Markets.—During 1900 the quantity of meat delivered to the Corporation Markets, Smithfield, amounted to 408,601 tons, 14 cwts., 2 qrs., against 405,456 tons, 9 cwts., 2 qrs., in 1899. The average supply was 1336½ tons per day.

During the year 1899, 1172 tons, 5 cwts., 2 qrs., was seized by the Inspectors as unfit for human food, which was made up as follows:—

1,034½ tons putrid meat.
95 „ diseased meat.
42½ „ unsound from accident or causes other than above.

The condemned meat was sold for £2735, 7s. 3d., but of course against this amount must be placed the expenses incurred by the Corporation in carrying out the work, such as: salaries of inspectors; chemicals for disinfecting baths; cost of haulage; rentals of condemned meat sheds; and the general handling and other incidental expenses.

The late Dr W. Sedgwick Saunders, M.D., F.S.A., medical officer for health, in the course of his reports gives the following warning:—

"To obviate any possible misconception it must be clearly understood that under no circumstances, nor from any quarter, malgré the certificate of a veterinarian, will tuberculous meat be passed by myself, or inspectors, at any of the dead meat markets within the jurisdiction of the Corporation of London; and further, that any person irrespective of his rank, attempting to poison the public with such stuff, will be prosecuted and rendered liable to fine or imprisonment. The conclusion arrived at by the Congress of Paris in 1888, and the subsequent adoption of the principles above enunciated by the largest municipalities, at home and abroad, fully justify the foregoing remarks."

The opening of the Annexe for the sale of American, Australian, and New Zealand meat has been justified by the extra supplies; for in comparing 1899 with five years before we find the following increases:—

22,797 tons general foreign meat and produce.
21,740 „ American, killed.
31,350 „ Australian and New Zealand, killed.

The following analysis of the 1900 figures, gives the source of the meat supply:—

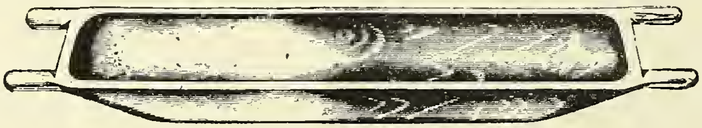
103,506 tons country killed.
59,855 „ town killed.
61,982 „ general foreign meat and produce.
95,110 „ American, killed.
89,925 „ Australian and New Zealand, killed.

The gross amount of tolls collected for 1900, amounted to £45,400, 3s. 10d., while the receipts from all sources amounted to £135,559, 12s., as compared with £130,570 5s. 7d., for the previous year.

Meat Supply (Paris).—The average daily supplies in ordinary times in Paris, are as follows:—1210 oxen, 450 cows, 13,929 sheep, 4398 pigs, and 1425 calves. In the month of September (1900) owing to the influx of visitors for the exhibition, the slaughter-houses at La Villette despatched a daily average of 5044 oxen, 1041 cows, 23,384 sheep, 3725 pigs, and 2099 calves.

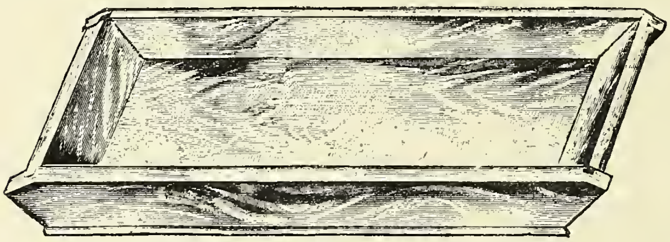
Meat Testing Thermometer.—see Thermometers.

Meat Trays.—These are of different shapes, and are also made in varying sizes. The ordinary carrying tray is the one most largely used as it is so easily handled. A lad



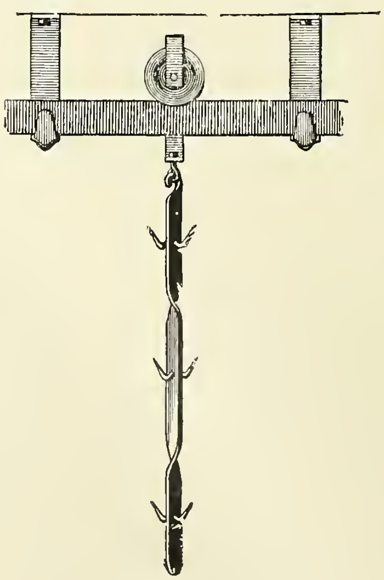
Ordinary Carrying Tray.

can quite easily carry, with one of these trays, on his shoulder a considerable weight of meat. They are made from blocks of ash scooped out and handles formed at

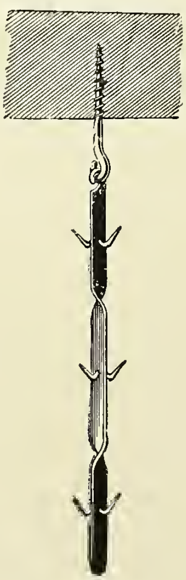


Salt Meat Tray.

either end. It is a common practice to bind each end of the tray with brass hoops so as to prevent splitting or



Travelling Meat Tree.



Fixed Meat Tree.

warping. The salt meat tray is made from white pine or similar quality of wood, and requires to be of a different shape and deeper, so as to keep the brine from spilling. It is made by jointing different pieces of timber together, and fixing wooden blocks on either end to form lifting handles. It is essential that the joints should be made water tight.

Meat Trees (Fitzgerald's).—The need for some simple device, so as to economise space in ham and bacon stores, is responsible for the invention of the meat tree. The object of these is to save space, and at the same time enable hams and other pieces of cured or uncured meat to be moved rapidly from one place to another. In handling hams for example, it is plain from the illustrations that six may be hung in very little more space than is usually occupied by one. There is no end to the use of this idea more especially as applied to bacon and ham factories.

Meat Troughs—In the operations of a sausage factory, or wherever small goods are handled, wood should be avoided as much as possible. It is always difficult to clean and to keep clean. Marble and enamelled iron should be used.

Enamelled iron troughs are now much used. They are built of a shape that is easily cleansed, and are convenient for holding meat, either in the lump state or the minced condition. As these troughs are used largely for hand mixing of meat, dough, etc., they are designed with two wheels on two of the legs—the obvious reason being that the trough will remain rigid, because of the absence of wheels on the other two legs. They are made a little longer so as to make up the distance between the centres of the wheels and the ground. The troughs are easily shifted from place to place; the one end is lifted by a handle and the whole is easily wheeled along. The sizes and capacities of those at present in use are as follows:—

No.	Inside Measurements.			Capacity.
	Length.	Breadth.	Depth.	
	Inches.	Inches.	Inches.	Lbs.
0	37½	17	10¾	100
1	41½	18¾	13¼	200
2	44¾	22½	15¼	300
3	56	25	16	500
4	78	24¾	15	700

Meat Weighing Machine.—see Weighing Machines.

Metric Weights and Measures.—see Weights and Measures.

Middle Hook.—see Hooks.

Middles.—Are the intestines leading from the bung to to the rectum; they are wider than runners, and are used for bologna, summer, etc., sausages. Generally speaking they hold at the rate of 30 lbs. meat to 1 lb. of skin.

Milk Imports.—see Dairy Produce Imports.

Milking Machine.—In the present state of the labour market a means of utilising machinery instead of relying too much on manual labour, is a desideratum, and although our fore-fathers would doubtless have smiled at the idea of

applying such a dictum to the milking of cows, it is nevertheless an accomplished fact. The "Lawrence-Kennedy" milker is a machine that successfully does the work of extracting the milk from the udders of the cow. Practical tests have been made with it at Riding Court, Datchet, near Windsor, in one of the byres of Mr Kinross, where forty-eight cows were stalled.

Meat Trough, mounted with wheels on two legs.

The apparatus was supplied to one side of the shed consisting of twenty-four cows, while the remainder of the cows on the other side of the shed were milked by hand in the usual way. After ten months' work, during which it was found necessary to make provision for many points that arose in practical work, Mr Kinross was satisfied that the milker was a practical success, and the whole of the forty-eight cows are now being milked regularly every day with satisfactory results on every point.

A similar apparatus has also been erected on the farm of Messrs R. Pigott & Son, near Cambridge, which has been worked about three months with equally satisfactory results.

The results may be summed up as follows :—

The forty-eight cows can be milked in an hour by one man, with a boy to help by carrying the milk away and keeping an eye on the boiler, etc., and no more hands would be required for sixty cows.

The milk was carefully examined by Mr Granville Sharpe, F.C.S., and reported "absolutely free" from any foreign admixture. When a practical farmer or dairyman considers the amount of impurities which are to be found in milk when milked by hand by the most cleanly of milkers, the immense importance of this point will be realised. This result is obtained by the "milker" not permitting the milk to come into contact with air while the cow is being milked ; the milk is kept in a vacuum from the teats to the pail which is air-tight, it will therefore at once be seen how the impurities which always abound in the air of every cow shed are kept out of the milk.

By a careful test it has been found that the milk from this apparatus keeps longer than that milked by hand from the other cows in the same shed when set up side by side.

The cows take to it very kindly after the first few days, as is shown by the way they go on feeding or chewing the cud while being milked. Young heifers when milked for the first time are found to take to the machine much more kindly than hand milking.

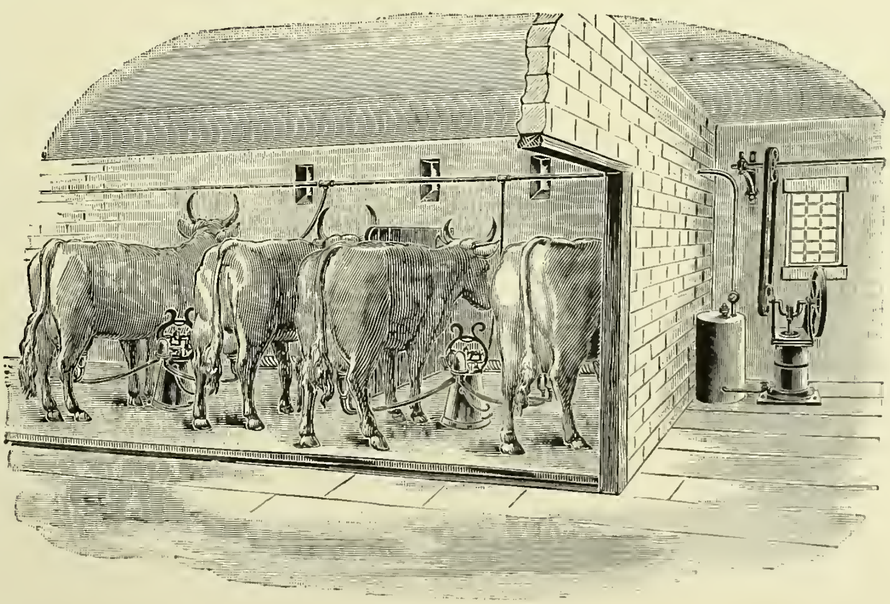
When the "milker" was installed at Messrs Pigott's farm at Cambridge, a considerable increase of the milk yield was manifest.

A careful watch was kept upon the teats and udders of the cows and it is considered that the effect of the "milker" is beneficial rather than otherwise, the same has also been remarked regarding the period of lactation.

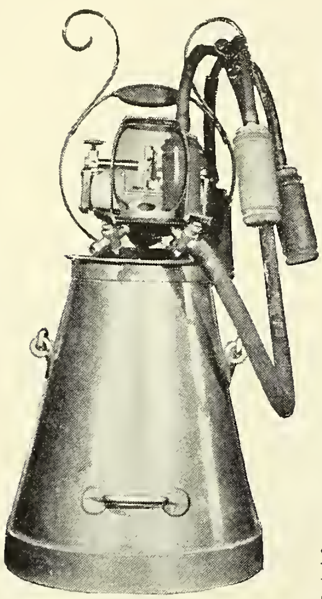
The "milker" is actuated by suction, which may be obtained by an ordinary vacuum pump worked by a steam, oil, or gas engine, or an electric motor, or a water wheel, or an ejector may be used attached to a boiler which creates the vacuum by a steam jet, and dispenses with the necessity for an engine.

Connected with the vacuum producer is a vacuum containing tank, and a range of pipes runs along the shed over the cows' shoulders. From this pipe a short branch descends between every alternate cow, having on it a vacuum cock. To work the apparatus, one end of a rubber tube is put on to this branch, while the other end is connected to the pulsator, which rests upon the cone-shaped pail placed between the cows near the manger, as shown in the illustration. From the pulsator two rubber tubes branch out right and left, one to each cow, and each tube is attached to four rubber teat cups which are slipped upon the teats of the cow.

When the vacuum cock is turned on, the pulsator commences to work, and causes the cups to collapse and expand and thus suck the milk from all four teats at once ; an almost exact imitation of the calf sucking its mother. The number of pulsations per minute, also the strength of each pulsation, can be regulated to a nicety by means of regulating screws, thus giving complete adjustability to the characteristics of each cow.



Milking Machine at work.



Milker with four teat cups and pail.

The milk on its way to the pail from the teats can be seen passing through a glass trap, which is protected by a wire cage. When the cow is milked clean it is seen that the milk ceases to flow through the glass trap, but the cups remain on the teats till they are taken off to be put on another cow.

The "milker" is easily cleaned by sucking water through the teat-cups, and the rubber is kept sweet, soft, and pliable when not in use by being immersed in lime water, and when properly kept in this way, is found to be very durable. As the pulsations occur only in the teat cups and the short rubber tube leading therefrom to the pulsator, it is impossible for any air to work back from the pipes into the milk, and the amount of vacuum pressure required is very small.

Mince Pies.—

- 1 lb. apples.
- 1 ,, suet.
- 1 ,, currants.
- 1 ,, raisins.
- ¼ oz. ground cinnamon.
- ¼ ,, ,, nutmeg.
- ¼ ,, ,, cassia.
- 1 lemon.

The whole to be chopped fine and well mixed. The rind and juice of the lemon are included in the chopping.

Pastry for above :—

- 1 lb. flour.
- 6 ozs. lard.
- ½ teaspoonful salt.

Place the flour in bowl and mix in salt; lightly rub the lard into the flonr and moisten with sufficient water to make a paste that will roll out. Cut into desired sizes, shape and bake as usual.

Mint.—see Culinary Herbs.

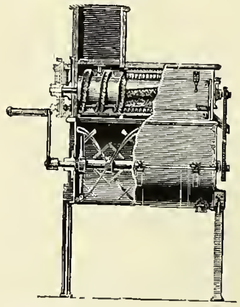
Mixer for Meat.—see Meat Mixer.

Mixing.—This term is applied in the bacon and sausage trade principally to two things—the mixing of spices and other ingredients for seasoning, and the mixing of dry antiseptic and granulated saltpetre for curing. The system of mixing by the hand is a very bad one where spices and peppers are concerned Not only is there a likelihood of its being imperfectly done, but it is highly objectionable as well. It is far better done in every way, mechanically.

The same remarks apply to the mixing of dry antiseptic and saltpetre for curing. These substances when mixed together are put on bacon as a preliminary to putting on salt, but the effect of them both is modified if they are not mixed in equal proportions

A mechanical mixer is therefore of considerable use to bacon curers and sausage makers.

The following illustration shews one of these appliances, and a description of the work it does is as follows :—



Seasoning and General Mixer.

1. Will break down and sift lumps formed in powders.

2. Ingredients can be placed indiscriminately into the hopper without previous mixing or blending.

3. Practically dustless and noiseless in working.

4. The brush being fitted in slide bearings can be regulated to the greatest nicety.

5. By a patent overtail process, all foreign matter too large to pass through the sieve is automatically removed from sifting chamber, without injury to brush or sieve.

6. Brushes being interchangeable, machines may be fitted with two classes, one to break down lumps into powder and sift, the other to sift only and pass lumps with foreign matter through patent overtail spout, only one of these, however, is supplied, unless another is specially ordered and charged extra. *The latter type has the gentlest possible action, and will, if required, remove foreign matter, insects, lumps, etc., from flour, powders, etc., without the least injury to same.*

7. A door being fitted over mixing chamber, the combined machine can be used as a mixer only, if desired, without sifting, and essences or liquids can be added without injuring or choking brush or sieve.

8. The sieve can be instantly withdrawn and a coarser or finer mesh put in, so that several extra sieves may be had with each at an extra cost.

9. All bearings are outside, and are easily lubricated without fear of lubricant coming in contact with the mixture.

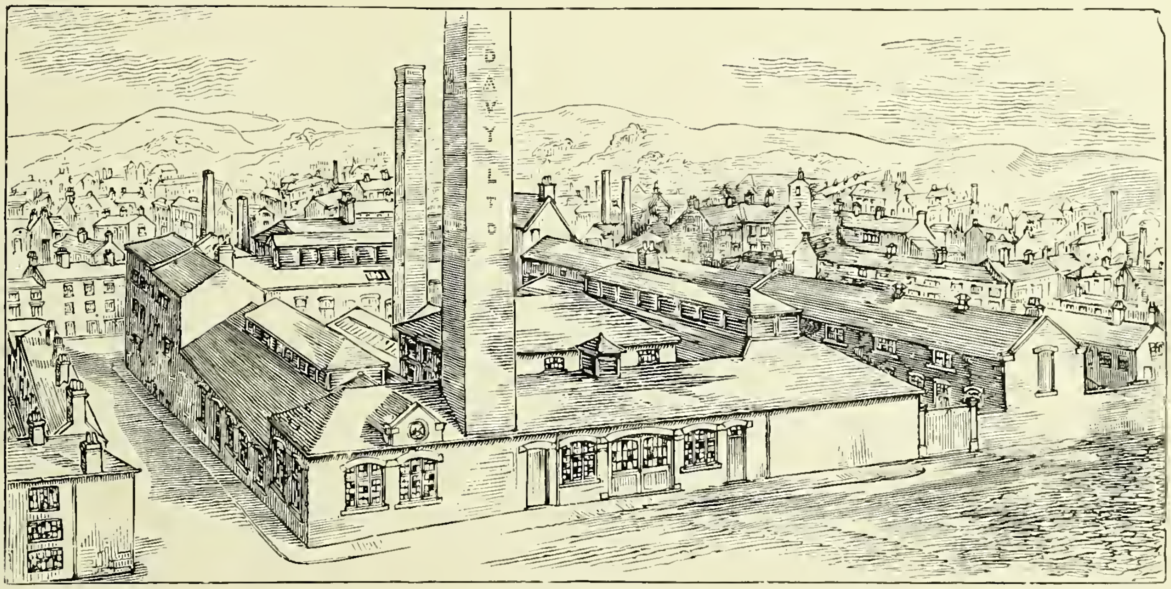
Model English Sausage Factory.—*The Sheffield Polony Factory of the Midlands* (written October 1899).—In the blackest town in the Midlands one would hardly look for the home of sausage making. And yet, why not? It is to the busy workers of such great industrial centres that sausage factories owe their prosperity. Ten years ago very little, comparatively, was known about sausage making on a grand scale in England—now the names of factories are legion. It is only now that the great advantage of having easily cooked, or already cooked, food is beginning to be appreciated. Sausages were not always the bearers of a clean record as they are to-day; neither were they, until quite recent years, recognised as a commodity worth serious attention. Fortunately, a different state of affairs exists nowa-days. The community demand sausages, and sausages they must have. If we are to judge by the splendid provision being made to supply these demands by Messrs Davy, of Sheffield, we would say that sausages the great British public will get.

The Germans and French have taught us here in England that *charcuterie*, as they call the profession of pork, if not an exact science, is at least a business of which much may be made. Germany especially is a nation of sausage eaters and *würst-fabriken*, as all know who

go there. We have not, however, cultivated the taste for garlic as a seasoning as they have.

We have in England what we daresay suits us better—the Sheffield polony. It is perhaps twenty-five years ago since Mr Arthur Davy, now Arthur Davy & Sons Ltd., commenced the manufacture of his Sheffield polony, and to him belongs the credit of initiating the making of these dainty commodities. There are many makers of them now, or, at least, of articles of the same name. We can judge, however, of Messrs Davy's popularity, when we mention that their present product of polonies alone is about ten tons per week.

The establishment is well known as situated in Paternoster Row, Sheffield. It is of very large dimensions, but is wholly inadequate to their business. Not only do they turn out the large quantity of Sheffield polonies named, but they also turn out many tons per week of pork pies, pork sausages, black puddings, brawns, luncheon sausages, cooked hams, etc., as well as bacon. Much business has had to be refused simply for want of accommodation, and it has become a simple necessity to acquire larger premises so as to successfully cope with orders. The prospective business is enormous, and under the present able directorship it is pretty certain that trade will rapidly increase.



Messrs Davy have therefore acquired the various properties in the neighbourhood of their present factory, and after demolishing all the buildings thereon, are proceeding to the construction of one huge building, joining same on to the present premises. The factory being constructed will be one of the finest in England.

The following is a description of the more salient features of the new factory, as described by the engineers :

The buildings will comprise pig-styes (with accommodation for about two hundred pigs), slaughter-house, hanging room, chill rooms, curing cellars, lard room, main work hall, engine and boiler houses, boiling room, polony, brawn, and sausage cooling and chilling rooms, bake-houses, packing room, offices, laboratory, etc., etc.

The slaughter-house will be fitted with modern mechanical appliances for handling the pigs expeditiously, and have the modern slaughter-house "tack." One feature of this department which will be entirely new will be a mechanical stirrer, designed by the engineers so as to keep the blood in motion and prevent its coagulation—the blood being afterwards used for the manufacture of black puddings.

The "hanging" house will be fitted with a continuous system of overhead bars, all connected up by means of adjustable "switches," and the bars will be carried throughout the adjoining chill rooms and thence into various parts of the factory.

The lard house will be fitted with a complete refining plant, including a "Douglas" agitator, as also cold lard filler. The cold lard filler is an appliance which enables the cooled lard to be filled into packages or bladders in the cold state.

The boiler and steam engine, supplemented by a large gas engine, do not call for special comment. The engines in the engine room will give off about 150 effective horse-power or thereabouts. The principal feature in the engine room will be the refrigerating machine (a No. 9 horizontal Hall's carbonic anhydride machine). It will not only be applied to the cooling of the chill room and cellars, but will be applied to special chill rooms designed by the engineers for the effective cooling of the polonies, sausages, and brawn. This new feature will enable these goods to be thoroughly chilled before sending out, and will ensure their arrival at destinations in a perfectly fresh and sweet condition.

There are two work halls—one for chopping the meat, and the other for boiling the various products sent out in the cooked state.

The main work hall is where the principal work of the factory is carried on. The cooled hogs are brought here along the track bars and divided up into the various sections necessary. Here are many tables and many chopping machines. Here also are sausage fillers and similar appliances. There are many other appliances and devices in this huge hall of an up-to-date character.

The boiling room is destined to contain. among other things, twelve 100-gallon jacketed pans of latest welded seamless joint design. This great battery, it will be observed, has a capacity of 12,000 lbs. at one time. But this will not be too great for the requirements of the business. Other appliances are for canning and preserving goods; cooking hams by means of Douglas's patent steam ham cookers, etc., etc. The cooked polonies and sausages will be suspended on movable racks and run into the cold rooms specially designed for cooling them at once. This will result in much saving of weight as well as of time. Of baking ovens on a gigantic scale, it is hardly necessary to speak, they are there already and will be added to very much.

There are, of course, in a factory of the dimensions described, many minor appliances of a useful character specially adapted to the business. Not the least among these will be the equipment of the chemical laboratory, in which the pickle will be made, sterilised, and tested before being let into the cellars for use. This one department alone shows an advance on ideas which have prevailed up till recent years. The all pervading bacteria is being so carefully provided against, that in a factory for food, with any pretensions to hygienic arrangement, a laboratory is an essential department. There are many factories where such a place would, at a small cost, provide total immunity from the danger of diseased food products.

Of offices and places for workmen and workwomen, it is hardly worth while to speak. Of course these departments are handsomely provided. Stables also, with elaborate fittings and stalls, form a large building by themselves.

This factory is destined to prepare and send out food for consumption in many thousands of homes, and it is pleasing to think that the firm of Davy have so realised the responsibilities to the public, that they have decided that their products, at least, shall be produced by the best possible appliances which money can buy, and human ingenuity can devise.

Molasses or Sugar Feeding for Pigs: (*Translated from the Danish of Erhard Frideriksen*).—All weights are Danish lbs.—According to the experiments made by the Experimenting Laboratory in pig-feeding, palm-cakes, beets (especially feeding sugar beets), and turnips are proved to produce pork of good quality. One must therefore, also think that a foodstuff composed of seed meal of palm, and the extract of sugar beets found in molasses in sugar making, should have the same effect. On the initiative of the manager, Mr G. Faye of Nakskov Sugar Factory, we have undertaken some simple experiments in pig-feeding, at the Danish sugar factories' property at Stokdemarkegaard, in order to see how this works out in practice.

Fifteen pigs weighing from 55 to 87 lbs. a piece were bought from the stock of a large farm and divided into three lots of five each, as nearly alike as possible. The three lots weighed 358·5 lbs., 353 lbs., and 359·5 lbs., *i.e.*, on an average per pig, 71·7 lbs., 70·6 lbs., and 71·9 lbs. They were placed in three similar good styes and every precaution was taken to ensure them exactly the same treatment throughout, whilst the experiment lasted.

The pigs were not exactly first-class quality as regards breed, but this fact has hardly had any influence on the result of the experiments. It was more unfortunate that one had to put in lot A, 3; in lot B, 2; and in lot C, only 1 hog pig, whilst the others were all sow pigs. It seems on looking at the growth of the single pig, that this has had a slight influence on the advantageous side for those wholly or mostly fed on barley.

The feeding was arranged in such a manner that all three lots, as a feeding basis, had 30 lbs. churned milk, and 120 lbs. whey per pig, in ten days during the whole experiment. Added to this there was also given in gradually increasing quantities, lot A, ground barley; lot B, $\frac{2}{3}$ ground barley and $\frac{1}{3}$ molasses; lot C, $\frac{1}{2}$ barley and $\frac{1}{2}$ molasses. The barley was grown on the farm, a good and saleable seed. The molasses feed was composed of 1 part palm seed meal and 2 parts molasses, with an analysis of digestible stuffs:—

Containing	Nitrogen,	11·30	per cent.
	Non-nitrogenous,	55·00	,,
	Fat,	1·00	,,
	Woody matter,	5·60	,,

The molasses and barley meal were carefully mixed.

It was found that lot A with barley meal only, took on, on an average, a weight of 1·11 lb.; lot B, $\frac{2}{3}$ barley meal and $\frac{1}{3}$ molasses, 1·05 lb; lot C, $\frac{1}{2}$ barley meal and $\frac{1}{2}$ molasses, 1·10 lb. per day and per animal.

The saleable value of barley on the spot at the commencement of the experiment was 4·50 öres per lb. Russian feeding barley was quoted in *Ugeskrift for Landmand*, at 4·15 to 4·25 öres per lb. If we keep to the lowest price for Russian barley and reckon 25 öres per 100 lbs. for meal, we get a price of 4·40 öres per lb. for barley meal; churned milk is reckoned at 0·75 öres; whey at 0·25 öres; and molasses fodder at 3 öres per lb. each.

The expenses, therefore, for feeding per pig in eighty days are as follows:—

Feeding Basis—	
240 lbs. churned milk at 0.75 öre per lb.	Kr. 1·80
960 ,, whey ,, 0·25 ,, ,,	2·40
Together	Kr. 4·20
Lot A.—	
Churned milk and whey - - -	Kr. 4·20
246 lbs. barley meal at 4·40 öre - -	10·82
Together	Kr. 15·02
Lot B.—	
Churned milk and whey - - -	Kr. 4·20
82 lbs. molasses fodder at 3 öre -	2·46
164 ,, barley meal ,, 4·40 öre -	7·22
Together	Kr. 13·88
Lot C.—	
Churned milk and whey - -	Kr. 4·20
123 lbs. molasses fodder at 3 öre - -	3·69
123 ,, barley meal ,, 4·40 öre -	5·41
Together	Kr. 13·30

From this the price for production per lb. of pork was as follows:—

Lot A - - $\frac{15·02}{89}$ = 16·99 öre.

Lot B - - $\frac{13·88}{84}$ = 16·53 ,,

Lot C - - $\frac{13·30}{88}$ = 15·01 ,,

By replacing ½ barley meal with molasses fodder a saving was effected of nearly 2 öres per lb. live weight produced during the time of experiment.

Of the fifteen pigs up to the present time, ten have been delivered and judged by Mr Wœram, Maribo Bacon Factory, viz., four from lot A, three from lot B, and three from lot C. The result of the bacon factory's criticism is that the pork was firm and of first-class quality, with the remark that efforts should be made to produce longer and leaner pigs, the fodder at the same time producing firm and good pork. In this experiment molasses fodder has stood the test and proved to be a good and cheap food for bacon pigs. It would be of further interest to watch its influence if used at an earlier stage of a pig's growth, and a trial is being prepared.

If a saving of nearly 2 öre per lb. live weight can be obtained by substituting ½ molasses fodder for corn fodder for pigs, there must be enormous sums to be saved throughout the country in the production of bacon pigs now, since the surplus export of saleable bacon has reached more than 120 million lbs. per year.

It would be advisable if every breeder of bacon pigs who uses corn as a mixture with milk offal should try molasses in practice. According to our experiments up to date, we can recommend molasses fodder as ½ part of a pig's food basis, provided it weighs over 50 lbs.

Mortadelli.—This sausage is always in request, and can be prepared and kept even in summer, and so always fetches a good price.

For 30 lbs. take—

17 lbs. of pork, very lean and from a very strong pig,
8 ,, lean young beef, from leg or neck,
5 ,, fresh back fat, cut into pieces this size.

Take the lean meats and chop them up, and add 1 lb. fine salt, 1¼ oz. Indian cane sugar, ¾ oz. saltpetre.

Put it all into a stone jar, pressed tight together, and keep for two days covered up. Then take out, chop *quite* fine, and season with 1¼ oz. fine white pepper, ⅓ oz. fine white ginger, ⅓ oz. mace, three sticks finely grated and salted eschalots; then add 2 or 3 lbs. of raw veal and chop all together again. Now put in a dish, adding a little water, and mix well together, then knead it all for a quarter of an hour. Add the pieces of fat, and work all together for another quarter of an hour See that the fat is equally mixed throughout, then throw it from hand to hand until it is quite firm. Put into the filling machine, and see that no air gets in. See that the skins are well salted and well dried, about 12 to 15 inches long, and very narrow. Dry the sausage well in winter for forty-eight hours in a room warmed to a temperature of 77° Fahr. Smoke with beech and oak sawdust into which a few juniper berries have been thrown. Let them hang till they are of a cherry-red colour, then let them *simmer*, *not* boil, for about one and three-quarters to two hours.

A sure sign of the mortadelli being ready is this: if they are taken out of the pot and the water dries off the skin at once, then they are ready; if not, put them back in the pot. Whenever they come out of the pot, roll them up in big napkins until they are perfectly cold, when they will be crab-red, which colour they will not lose.

Moulding Machine for Pies.—see Pork Pie Making.

Mould Preventing Powder and Solution.—The former of these is a white inodorous powder and the latter a solution of the same in water. Both are used in preventing the growth of mould in sausages, etc., the solution being used for dipping the sausages into and the powder for dusting over them.

Mudgrooms.—The term used by bacon curers to describe the fat attached to pig's intestines and which is stripped off and sold as second lard after rendering.

Municipal Knacker Yard, Hamburg.—The methods of knackers have been for centuries in bad odour. The trade was boycotted, and the persons engaged in it regarded as "dishonourable." It is only of late that general interest has been awakened in this particular department of public health, the result being that the total extermination of the dead bodies of diseased animals is stringently enforced, not only to prevent the use of such meat for human consumption, but also to prevent the spread of epidemic diseases as far as possible.

The Municipal Knacker Yard in Hamburg does not lag much behind in the general march of progress. For the past few years it has been managed by the Police Magistrates, and has been fitted up anew by them with machinery, etc., which will be described in detail in the following pages.

1. *Historical.*—The knacker yard business in Hamburg, as in other places, has been in existence for many years. It is known that there was a knacker's yard in the city as far back as the fourteenth century. In the sixteenth century the knacker's yard was handed over to the "Frolm" body, for the execution of judgments (capital punishment in particular), and thus also obtained the title of "Frolmerei" while the Frolmerei buildings were utilised as part of the prison in the year 1815.

The exercise of office of public executioner has remained up till the present connected with the management of the Frolmerei (knacker's yard).

The original "Onn Berge" Frolmerei, opposite St Peter's Church, was afterwards removed to a site in the neighbourhood of Alfred Strasse, by the Lubeck Gate, and from there, in the year 1878, to the Barmbecker Fields, where the present-day building is situated.

2. *Management.*—Until the year 1882 the knacker's yard was managed in this way—

The knacker, who also officiated as public executioner, could dispose as he pleased of all the dead bodies of the animals, and, in addition to this, received from the public exchequer the sum of 3,168 marks annually, and a free house. The only stipulations were that he must keep up the necessary staff of assistants, and draw up an inventory of the living and dead animals. The knacker's yard, which belonged to the State, was kept in order at the public expense. An "instruction" was drawn up for the knacker

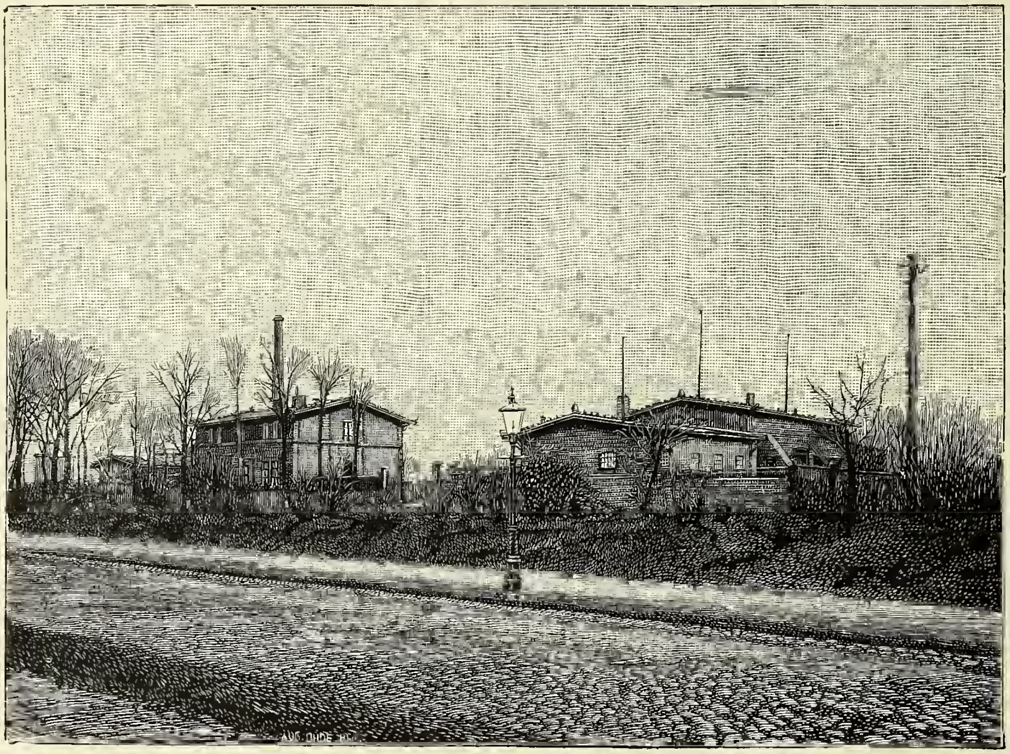
[The above historical and general account of the utilisation of condemned carcases and animals, was issued by the Municipality of Hamburg, and as it is full of interest to all those interested in that subject, we give it here].

as to how he should conduct his business, the police magistrates being appointed to see that he carried out the orders laid down; otherwise no restraint was exercised over him in his business relations.

When at the end of the year 1882 the then Frolm retired from office, it was decided not to fill his place, but rather to make it a Government monopoly for the time being, in order to obtain an estimate of the income of the knacker business, and also to establish a scale of prices to be paid as an indemnification to the owners of the diseased cattle, etc., which put an end to this place, in answer to the repeatedly expressed and highly justifiable solicitations of interested parties. For this purpose a knacker yard manager was appointed provisionally, who, besides receiving as salary 3168 m. annually and a free house, got a percentage of the gross receipts (at first 4 per cent., afterwards 12½ per cent.), the entire revenue flowing into the State exchequer.

that in the knacker business the greatest care must be taken to ensure the most certain and practicable destruction of the quantity of refuse, for the most part most dangerous to the public health, and the hygienic perfection of the business arrangements of the place. It is evident that it is difficult to obtain this end when the place is rented out to anyone whose main object is to make money thereby. Only by direct magisterial management can a careful oversight of the stipulated sanitary arrangements be sufficiently guaranteed, and a good sharp look-out kept over the progress made in the technique of this calling.

These considerations have led to the decision to give up entirely the idea of renting out the knacker yard, and to convert the Government monopoly (formerly only provisional) into a lasting concern. For this a suitable manager had to be found to conduct the business, which had meanwhile largely increased, with whose duties the office of



General View of the Podewils Factory, Hamburg.

This arrangement, which at first only held good for one year, was afterwards prolonged from year to year, until the end of 1893, with but slight alteration. For various reasons it was not practicable to come to a definite understanding until then. It was made clear, however, that the erection of a public slaughter-house, the enforcement of compulsory slaughter and obligatory meat inspection entirely altered the position of the knacker yard business. The income of the business varied so much that it was not possible to make an estimate as to how to lease it out; besides, the collective experiences of ten years of the business made it clear that a Government monopoly was infinitely better than a lease of it to anybody, particularly as regarded the oversight of the business. The latest views on this subject show with reason

executioner could no longer appear connected.

Therefore, since 1st January 1894, an official has been appointed as "manager of the municipal knacker yard," with a salary of from m. 2,800-3,400 marks, according to the balance sheet, while below him is an overseer, with a wage that does not fluctuate with the balance sheet. Manager and overseer have both to live on the premises.

3. *Business Arrangements.*—The Hamburg Knacker Yard has passed through every stage of development in the course of the history of the trade.

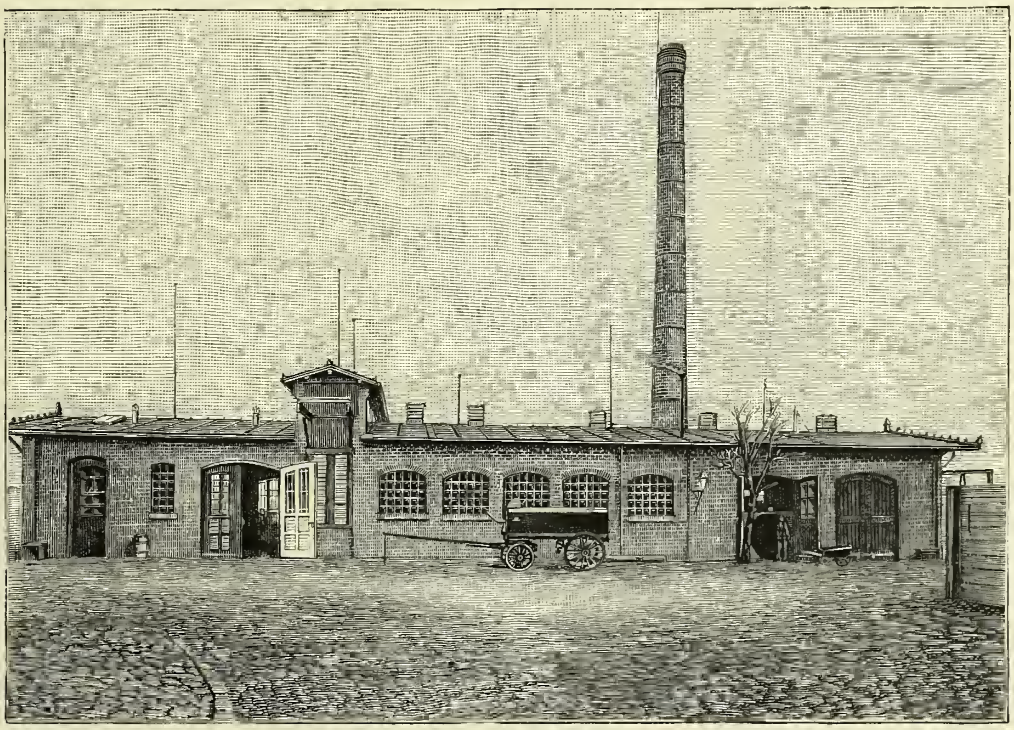
For centuries, only the skins were retained and utilised, while the carcase was got rid of by burial. It is only since

the middle of the nineteenth century that carcases have begun to be made use of. These were at first boiled in open boilers, at the outset, on an open fire, but latterly by the use of steam. The fat obtained was saved and used for technical purposes. From these primitive methods the mode of steaming the carcases in closed boilers was resorted to. Until a few years ago, large perpendicular cylindrical vessels (digestors) were used in this yard for the purpose. In these the carcases were steamed by means of conducted steam of considerable pressure. When the steaming process was ended, the fat boiled out was drawn off and filled into barrels, for sale in the market.

The method of preparing the carcases in digestors was superior to that of the open boilers, because, by the use of steam pressure at a temperature of 120-140° C., a certain extermination of any disease germs in the carcase was insured. But even this arrangement left much to be desired. The refuse, consisting of strong gluey water and included within the radius of the rapidly growing towns in more distant places.

It was therefore necessary to be done with present methods as soon as was practicable, and in the year 1893, a special apparatus was introduced for utilising animal carcases and slaughter-house refuse (Podewils apparatus). This apparatus differed from the early systems in a very important way throughout, as it not only made it possible for the steam to work on the meat so as to extract the fat, but also undertook the evaporation of the glue water, and the thorough drying of the pieces of meat and the bones, and the transformation of these into marketable powder (meat meal).

The process of boiling and preparing (removing fat and kiln drying) is effected entirely in firmly closed vessels which emit no odour whatever. After the experience of several years this method has proved so cleanly and odourless that



Inside View of Factory, Hamburg.

decomposed meat and bones, could not be utilised in the Knacker Yard. Only the few stronger bones, which had withstood the influence of the steam, could be sorted out and sold. The other meat and bones were first buried, and afterwards sent to one of the manure factories in Prussian territories. The gluey water was allowed to run into the fields, but as this became illegal, a sum of money had to be paid for its removal. The whole business sent up an evil odour, which was a source of great annoyance to the surrounding neighbourhood. For this reason there could be no question of drying the solid refuse on hurdles, kilns, or stoves. Indeed, if such a utilisation of the refuse was proposed, the Magistrates would be under the necessity of removing the knacker yards, which would soon be the establishment may remain without question on its present site in spite of the buildings on all sides of it.

The first of these new apparatuses to be erected proved inadequate. The result of the opening of the new slaughter-house, and the introduction of compulsory slaughter law, combined with meat and trichinosis inspection, was that a second Podewils apparatus had to be fitted up in 1894, which, in 1896, was followed by a third apparatus of the same system and the same size.

In 1894 also the entire Knacker Yard was enlarged and improved, with special regard to the fact that in establishments of this sort great prominence must be given both within and without to the cleanliness of everything in use on the place.

The establishment, which is 3,500 qm. in circumference (see illustration page 242), has on the Steilshoper Strasse frontage, a front garden and the dwelling-houses of the manager and overseer. The paved court behind is flanked on the one side by the works, on the other side by stables, both at right angles to the dwelling-houses. The illustration on page 242 gives a view of the whole building, and on page 245 a ground plan of it, while on page 243 there is a view of the works, and on this page the stables, both taken from the yard.

In the works there is a slaughter-room in which the carcases are skinned, and as far as necessary cut up for the loading of the Podewils apparatus. On the side next the engine room there is a lift on pulleys, by means of which carcases are conveyed in tilting waggons on to the bridges over the apparatus, in which are trap doors. The lifts are so constructed as to carry large animal carcases. The loading openings of the Podewils apparatus are too small for the introduction of the carcases of large animals which have not been cut up. In order to make the latter thoroughly uninjurious, the digestor is made with a lid, which can be raised, and which is the same size in diameter as the boiler for which it is fitted. The carcase is boiled in the digestor by means of steam pressure, and the refuse then put in the Podewils apparatus to be dried after the fat is run off.

The floor of the slaughter-room is composed of light troughs of asphalte, with slopes towards a grating which receives the blood and the foul water. These drains, for sanitary reasons, are led through pipes, with a cistern in the engine room, and there evaporated like the rest.

In the engine room there are, besides three apparatuses and the closed barrel for the reception of the fat from the apparatus, a wall steam engine and an air pump, with an injection condenser. By means of the latter arrangement the vapours escaping from the carcases during the boiling and drying processes are sucked up and condensed, and then led into the public sewer. The fat separator is provided with a rose, a tap, and a sink pipe, by means of which the fat is drawn off and stored in barrels ready for sale. The floor of the engine room is laid with "Mettlacher" flags, and the walls are set with tiles the height of a man to ensure greater cleanliness. The meat meal coming out of the apparatus is conveyed into the store room behind at a somewhat high level on a slanting plane by means of tilting waggons.

The store room is fitted up like a simple shed with sky-lights, because the wall space cannot be spared. The meat meal is emptied out of the apparatus into this place through a sieve. The remaining pieces, which have not been sufficiently powdered, are put into the apparatus again for further treatment. For the storage of skins and hides, and also of barrels filled with fat, special storage cellars or rooms are provided.

Stables, Hamburg.

In the boiler house there are two Cornish steam boilers, of 25-55 c.m. heating surface. At first the business was carried on with only the smaller boiler in use, but its power was insufficient. For businesses of this kind it is necessary to have two steam boilers, so as to prevent any suspension of work, should one for any reason be out of working order. The water necessary for working this has been supplied by the Municipal Water Company since 1893. Previously it was obtained from a well near by.

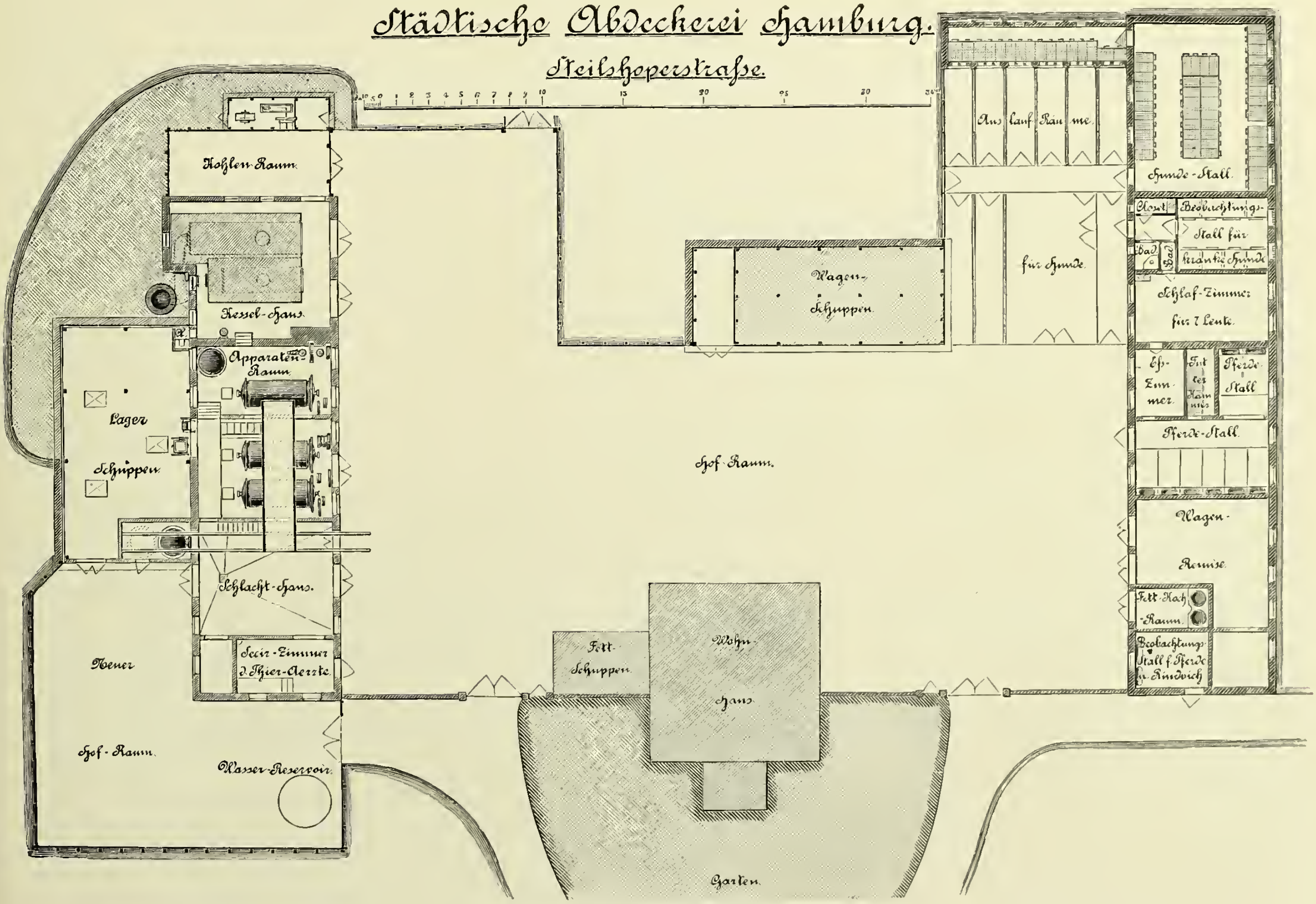
In another room in the works there is a machinery arrangement for the opening of tins. The transatlantic

traffic of the great commercial town results in the fact that from a variety of circumstances, preserved foods of every sort are often shut up in tins in a decayed state, and must be taken away by the knacker.

Finally, there is in this building a veterinary dissecting room with the necessary instruments, apparatus, and vessels, amongst which is a movable and rotatory dissecting table of special construction. The floor of the dissecting room (see page 247) is of cement. It is heated by means of steam from the boiler. Veterinary dissection is practised in every case of infectious diseases, and requires that the fitting up of the dissecting room should be attended with every caution, so as to prevent the spread of epidemic diseases.

In the stables there is a dog kennel, in which is kept all the strayed or ownerless dogs that are found. For dogs which are to stay a considerable time, there is space where they may run about behind the kennels, this latter being in the fresh air. Further, the stabling accommodation contains waggon sheds, horse stables, fodder lofts, rooms and lavatories for the staff of workers, and also an observation room for mad or suspected dogs, and a similar one for larger animals, with corresponding fittings. In both of the observation rooms there is a disinfection pit for the refuse, which makes it possible to render the drainage uninjurious before leading it into the general sewer. The employees' rooms and the dog kennels are heated from the boiler house by steam.

The bathrooms too are provided with steam pipes, by means of which one can have a hot bath at any time. These arrangements are a crying necessity in the knacker business, because it is most desirable that the men employed should have an opportunity of cleansing their bodies thoroughly after such dirty work and contact with dangerously infected matter.

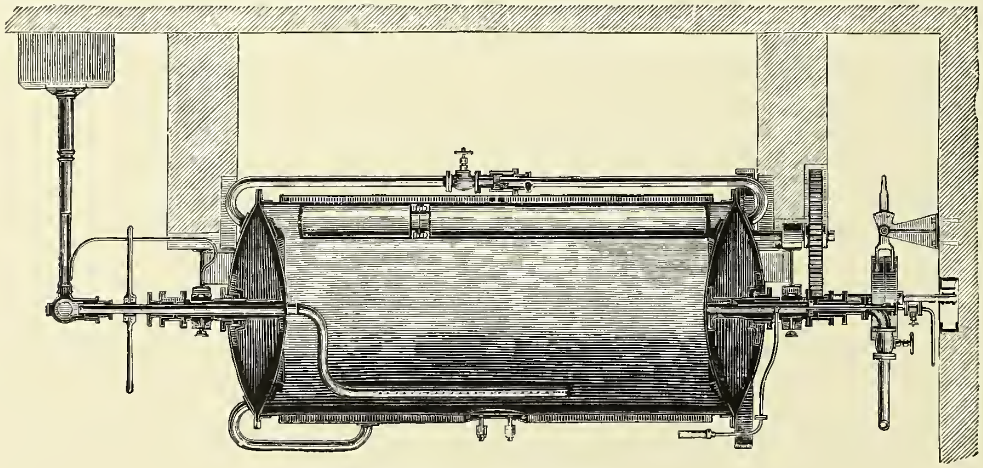


Ground Plan, Podewils Apparatus, Hamburg.

The regular staff of the knacker yards consists of the manager, the overseer, two engineers, and six or seven assistants. As a rule the latter take up their residence in the building, on the understanding that, because of the peculiar nature of the business, regular working hours cannot be arranged for. At the beginning and end of working hours, and also at the intervals for meals, they must relieve each other in rotation.

4. *How the Raw Material is Obtained*—Ever since its existence the Municipal Knacker Yard has had to remove

and destroy all sorts of diseased and tainted meat, and all the carcases of dead animals in the municipal police radius. It has also had for many years to see to the catching and killing of ownerless dogs. Of late years to this has been added the capturing and killing of strayed cats, which are roaming about in house gardens and public places—this for the protection of singing birds. Since 1894, the knacker yard has enlarged its activities, since meat inspection and trichinosis inspection were enforced, and suspected animals, and parts of such, could be removed from the abattoir and thoroughly destroyed.



Podewils Apparatus at Hamburg.

In order to carry on the business the knacker keeps some carts and six or seven horses for the carriage of smaller goods. The larger carcases have been brought in from the streets and the stalls for many years in open block waggons, furnished with racks. The carcases are hoisted into the waggons by means of a windlass. Besides these, an arrangement has been made with a private conveyance contractor to construct a transport waggon of new design, in which to convey carcases to the knacker yard at the outskirts of the town in cases when haste may be necessary. The block waggons are also used for the cartage of tainted goods. In every case the goods in these transport waggons must be covered with a tarpaulin.

For the conveyance of living dogs and cats, and also of small animal carcases, etc., box waggons closed right round and with cell-like fittings inside are in common use, by means of which a daily round can be made to collect in a regular manner. These special waggons are illustrated on page 249.

The meat taken exception to at the official meat inspection, is conveyed to the knacker yard in tightly closing water-tight tank waggons, one of which is devoted exclusively to slaughter-house use, and first serves in the meat inspection room as a store in which to keep the articles taken objection to. When full it can be taken to the knacker yard and changed for an empty one. These tank waggons have an iron framework of half circular form, which are filled from an opening above, secured by a sliding door. These traps, after the filling of the waggon, are secured by a bolt and lock, keys of which are only to be kept in the slaughter-house and the knacker yard. These waggons hold on an average about 2,000 kgs. when comfortably filled. Illustration, page 248, represents the waggon in two different positions. The emptying of the waggon in the knacker yard is not effected by the opening at which it is filled, but by an opening at the back of the waggon, which is in general kept closed and tight by means of a carefully screwed cover. The construction of this is shown by illustration on page 250. These waggons ensure in this way, the certain conveyance of the confiscated goods from the slaughter-house to the knacker yard, about 8 km. distant. It is a special advantage of these waggons that carry confiscated goods from the meat inspection offices, that they are not loaded before or after with any other goods from the slaughter-house.

A similar waggon is kept at the central fish market, and carries away unsaleable fish, fish refuse, etc. This waggon is also exchanged for another on occasion by the knacker yard.

Finally, these tank waggons are eminently suited for the conveyance of blood from the slaughter-house, as on their arrival at the knacker yard the contents can at once be thrown into the Podewils apparatus.

For regular use the conveyances belonging to the knackeryard are sufficient. When there is an extra press of business, steps must be taken to hire conveyances. For instance, in December 1895, twenty hired waggons were employed for several days, because of a great storm in the North Sea, in consequence of which 129 cattle died on board a Danish transport ship, and had to be conveyed from the port to the knacker yard.

The knacker yard is connected with the town by telephone and telegraph.

5. *Products of the Business.*—Since ancient times the skins and hides of dead animals were acquired by the knackers, and put to the most varied uses according to their kind. Contrary to the usual custom in butchers' businesses, pigs were skinned in the knacker's yard. From the horses' carcases the horse shoes were taken, and also the tail and mane hair, for various uses.

After the carcases were cooked, the melted fat formed the principal product of the knacker's yard. This fat was, it stood to reason, only useful for manufacturing purposes, and served, as a rule, for the making of soap. Besides the fat, the bones were also obtained by this boiling process. Since the use of steam pressure the quantity of bone obtained is very small, because the most of the pieces of bone could not withstand the influence of the steam.

The production of meat meal (animal meal, carcase meal, meat guano, fish meal) first began in this establishment in 1893, with the introduction of the Podewils system. The product was first brought into commerce as manure, and as such was eagerly purchased by the farmers of the neighbourhood. That it possesses a high value as manure is evident from the subjoined verdicts of the Agricultural Inspection Stations in Halle (Saxony), and Keil.

Analysis and Verdict.—Of the Agricultural and Chemical Inspection Stations in Halle (Saxony), as to the meat meal and fish meal produced in the Municipal Knacker's Yard in Hamburg.

Halle (Saxony), 25th July 1895.

To the Police Magistrates in Hamburg.

The samples of manure forwarded on the 25th July have been tested with the following results:—

Journal No. 2133.

Meat meal -	7·50	per cent.	water.
	8·95	,,	nitrogen.
	5·85	,,	phosphoric acid.
	1·10	,,	protoxide of potash.
	3·90	,,	lime.
	16·00	,,	mineral substances.

Journal No. 2134.

Fish meal -	15·93	,,	water.
	8·80	,,	nitrogen.
	4·50	,,	phosphoric acid.
	1·35	,,	protoxide of potash.
	2·80	,,	lime.
	15·05	,,	mineral substances.

Both samples are very valuable manures, for they contain —No. 1, 8·95 per cent., and No. 2, 8·80 per cent. nitrogen, and also 5·85 per cent and 4·50 per cent. phosphoric acid.

The nitrogen is for the greater part in organic form in both samples, the phosphoric acid only in the slightest measure bound up with the lime, and therefore in a form easily assimilated with the plants, so that both specimens are valuable both for their nitrogen and phosphates. The small quantity of protoxide of potash (1·10 per cent. and 1·35 per cent. respectively) comes less into consideration, but the results given by the manure are always useful and progressive.

As to the use of these manures I could add the following:—

"As the nitrogen is contained in the form of organic substance, it is as such, not quick, but effective in the end, and experience has proved that similar manures, long known and of a light origin, and much prized by agriculturists, is best for use as manure for winter seeds. Rye and wheat manured with these manures develop powerfully in Autumn, and have splendid long stalks, but on the other hand are not so luxuriant as with a manure with nitrate of soda and hydrosulphuric acid, which easily results in a too luxuriant growth in winter, and is then sacrificed to the inclemency of winter and early spring. This is, as has been said, not to be feared when the manures above analysed are used, and are therefore to be recommended for winter seeds. As to the soil for which these manurés are best suited, perhaps a sandy soil is preferable, in which a manure with organic nitrogen keeps best and pays most, but it is also not unsuitable for lime and clay soils."

(MAERCKER).

Analysis and Verdict. — Of the agricultural and chemical laboratory of the economic testing station in Kiel, as regards the meat meal and fish meal produced in Hamburg Knacker Yard.

Kiel, 25th July, 1895.

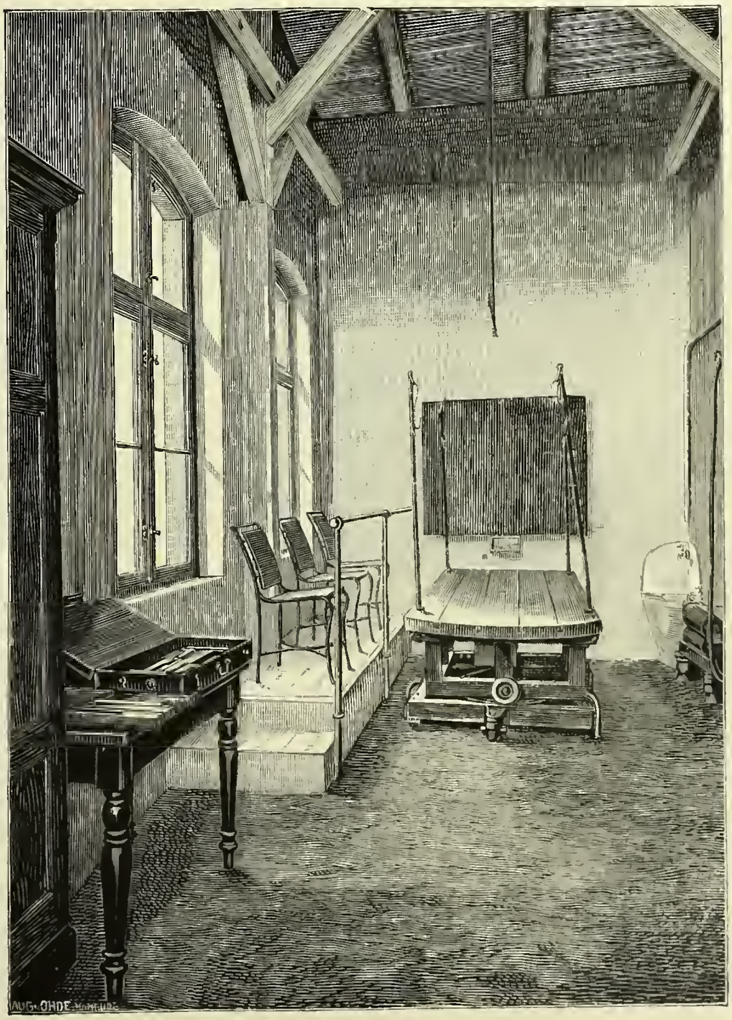
To the Police Magistrates in Hamburg.

The two samples accompanying yours of the 25th, (1) meat meal, (2) fish meal, contain the following ingredients:—

Liquid.	Meat meal. per cent.	Fish meal. per cent.
Liquids	7·82	15·06
Ashes (mineral)	17·28	15·84
Organic matter	74·90	69·10
Further—		
Nitrogen	8·67	8·80
Ammonia Nitrogen	0·20	0·37
Phosphoric Acid	6.39	4·91
Protoxide of potash	0·90	1·11

The valuable constituents are the nitrogen (barring the small quantities of ammonia nitrogen), the phosphoric acid, and the lime. The value of the said minerals rests on the considerable quantity of nitrogen and a smaller quantity of phosphoric acid, while the protoxide of potash follows it up close.

As manures, both meals are to be recommended for many purposes. The effect of the nitrogen will not fail to manifest itself, as it is present in the form of remnants of meat fibre, a substance which, after further decay in the ground, tends to form soluble nitrogenous compounds under suitable conditions.



Dissection and Demonstration Room, Hamburg

As the manure is poor in lime, and contains a great quantity of organic material, which, when it decays, is capable of forming acids, the use of these substances is to be recommended in soils not poor in lime, or which has first had the necessary lime added to them by a mealing or lime manure, or pure chalk meal (both done a long time before).

The said manures can be used in a similar manner to stable manure, but on comparing the two, one finds that the samples now before us are poorer in protoxide of potash than stable manure

According to C. Wolff, these are the proportions in the three manures.

	Nitrogen.	Protoxide. of potash.	Phos-phoric	Organic sub.
1,000 parts. Moderately decayed stable manure .	5	6·3	2·6	192
60 parts. Meat meal I. . . .	5·2	0·54	3·8	45
60 parts. Fish meal II. . . .	5·3	0·66	3·0	41

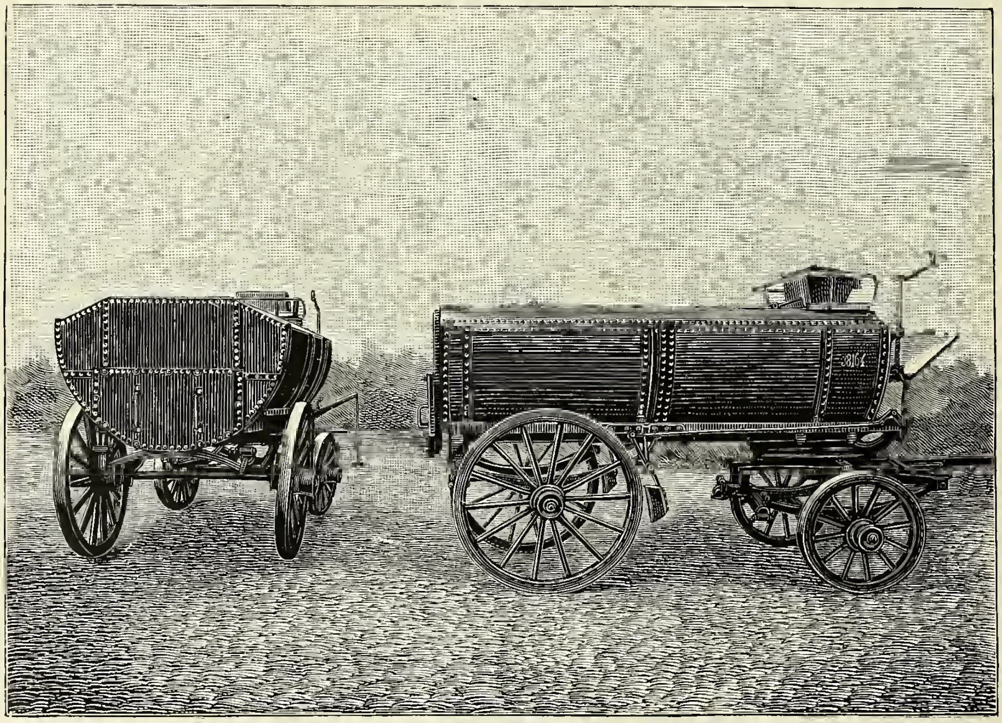
organic material is of less importance, as on light soil one can produce a strong vegetable earth by the culture of lupius, saradella, and other leguminous plants.

The manure is specially suited for the cultivation of grain, potatoes, turnips, and similar roots, also of vegetables, but not so much for the cultivation of leguminous plants. For meadows it can only be used when very cheap, and always in conjunction with kainit.

On better ground, instead of using these manures in lieu of stable manure, they should rather be regarded a complement to it, like Peruvian guano and fish guano. On account of the plentiful supply of nitrogen, one must be careful in the culture of grain, giving about 4-5 centner the hectare, or even less, with perhaps an addition of phosphoric acid; for instance, 2-3 centner of superphosphates pr. hectare, as the manure meals in question contain considerably less phosphoric acid than guano, bone meal, and the like.

An admixture of kainit on the other hand is not advised on better soils, especially for the cultivation of grain.

(Professor A. EMMERLING).



Tank Waggons for Collecting or Removing, Hamburg.

Thus, 60 lbs. of meat meal or fish meal contain rather more nitrogen and phosphoric acid than 1,000 lbs. of stable manure, but much less protoxide of potash, and considerably less organic material.

If then instead of stable manure the above-mentioned meal meat or fish meal is used a corresponding addition of some lime is necessary—for instance kainit (containing 12·4 per cent. of lime).

As kainit is specially suited for light and sandy soil, it follows that the meat or fish meal in question should be used on such a soil, and with an admixture of kainit if it is to take the place of stable manure. Here the lack of

With the use of the manufacture as manure, the knacker yard had followed usual lines, but very soon well grounded doubts must have arisen, whether their way was the right one under new conditions, without mentioning that in consequence of the rapid fall in the prices for artificial manures of late years the proceeds had considerably decreased. Considerations of an economic nature proved that their productions might be used as fodder, on account of their richness in nourishing material. This appeared all the more feasible when a very similar product, namely, the dried and ground scraps product from a meat extract factory, was favourably received by the farmers (under

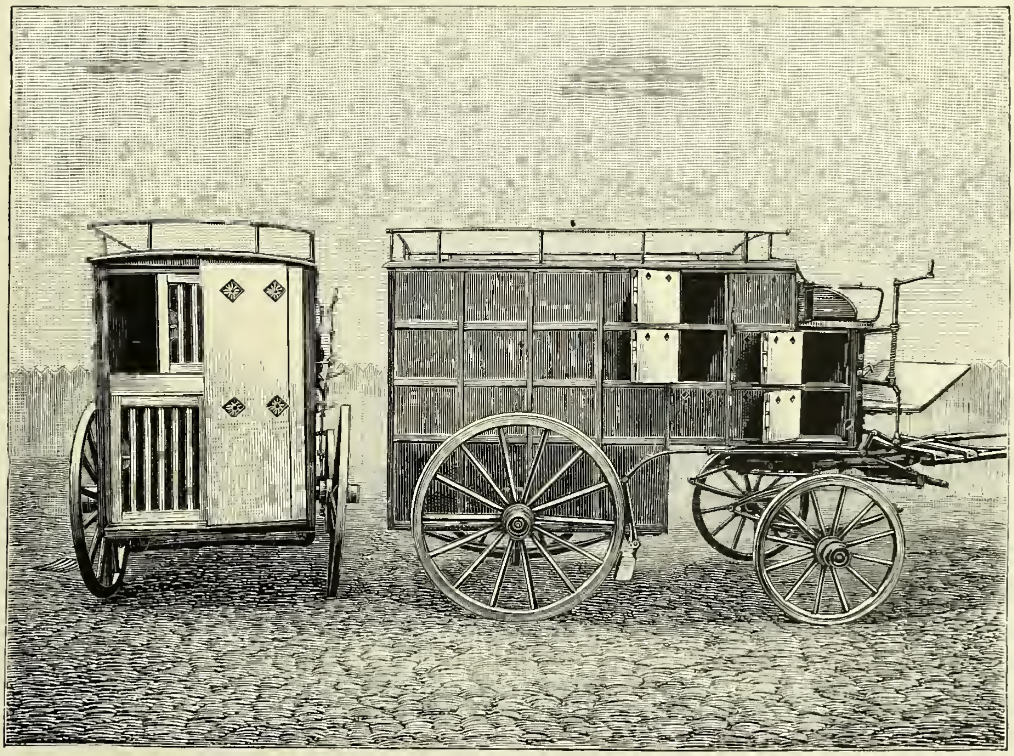
the name of Liebig's and Kemmer's Meat Meal), and used by them as fodder, with good results.

The experiments made to put these products on the market as fodder were at first far from successful, owing to the odium attached to their origin. It could be said on all sides that the material, by the long continued influence of steam at a high pressure, is divested of all disease germs, and that to ensure safety, experiments had been made in feeding small and large animals on this meal, and that a thoroughly favourable result had been obtained. The opposition was so strong, and supported its objections by averring, not without truth, that the majority of knacker yards are not provided with such perfect working implements, etc., as to justify their fodder being used without question. On the other hand, it is evident that a century of old prejudices against knacker yards and their belongings could not be removed by one single stroke.

greatly interested. The favourable results gained by these experiments on a small scale, led them to more ambitious undertakings, and the consequence of this was the use of the knacker yard fish fodder, the result being a very considerable increase of fish in close waters, and at the same time a corresponding shortening of the feeding-up time, the value of which is now uncontested. The *General Fishery Journal* (No. 7 of 1896) expresses itself, in an article, on the feeding of fish with food prepared by the Podewils system in the following terms :—

"In the summer of 1895, exact experiments were made in the feeding of fishes in the Upper Palatinate with meat guano prepared in the Munich Thermic Extermination Works, the results of which are given below.

It was first ascertained that chars and carps took up the food greedily from the first day, and in a short time all the mud in the feeding tanks disappeared, so that the



Collecting Waggon for Small Animals, Hamburg.

The boycotting by the trade in this matter made it necessary to approach the consumers direct. By the use of "fodder meal" as fodder for cattle, the fact was quite overlooked that fish might be fed by this means, because no one had a means of knowing if they would feed on carcase meal or not. But circumstances finally favoured the idea because, in due course, the breeding of fish received an impulse, especially in agricultural circles, where, driven to it by the unfavourable condition of their principal work, the farmers began to add to their other occupations the cultivation of fish ponds.

Not only did the German Fishery Association begin to make experiments in biological and fishery and experimenting stations on the Meggelsee, but they were followed up by prominent fish breeders, who found occasion to be

cleanly scoured stones under the surface became visible. The flesh of the fish killed directly after several months' diet of the food, the digestive organs of which were filled with meat guano, was perfectly tender and tasty.

The experimenting ponds were filled with fish, about 7-13 to every quadremeter, so that the natural taking on of weight without feeding would be very inconsiderable.

The chars were small fry, about 8 c.m. long on an average. These visibly increased by being fed. The cost of feeding them was about 50 pf. the lb. On an average 5-6 lbs. of meat guano was used to put on 1 lb. of fish meat; 3 lbs. of meat guano were used on an average to every lb. of fish meat.

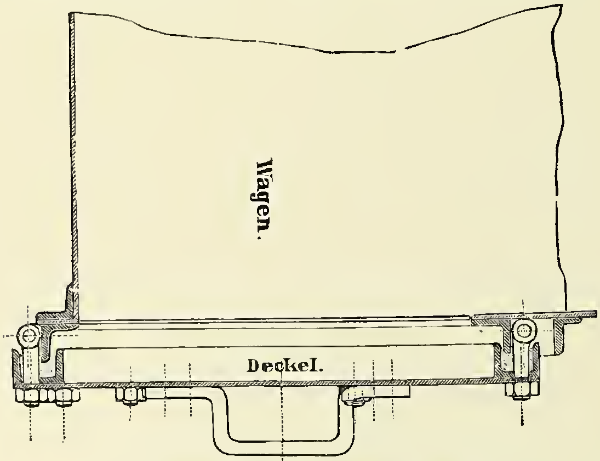
The carps were fed in ponds in which there were not more than seven fish of different sizes in every 34 quadremeters. It cost 28 pf. per lb. to put on 1 lb. of fish meat.

In one carp pond few favourable results were obtained. It lay with other ponds in a marshy meadow, and had been the previous summer moderately full of frogs. The frogs flocked from the neighbouring ponds and meadows in thousands, and sat near the feeding places in great nests. Here the cost of the meat was 57 pf. the lb. To gauge this result aright, it has to be taken into account that very few broods of carp came through because of the frogs, while a very numerous and well grown brood of young fish were fished in with them. These had not been taken into account in the reckoning. The frogs appeared to prefer meat guano to fish spawn.

Although the results in the pond with the frogs were not so favourable, all the others were so much so that further experiment was unnecessary.

The Municipal Knacker Yard at Hamburg is already selling great quantities of their tested meat guano for the purpose of feeding fish, and a great pond owner in Bohemia is getting meat guano in large waggon loads from Hamburg.

The most practicable way to achieve the meat feeding is to stir up the meat guano with some water. All fish take up this food from the bottom of the pond greedily. Shower and other fish of prey can be fed in this fashion by the scattering of dry guano, which then swims on the surface, But there is always the danger it may be blown away, whereas the soaking of it first prevents loss of that kind."



Detail of Sealed Part in Waggons, Hamburg.

The growth of the trade in guano fodder received a special impetus by the Industrial Exhibitions of the Knacker's Yard in Berlin and Kiel, in 1896, with which was connected the Fishery Exhibition. The manufacture was in this way made known in wider circles, and soon had such a popularity that orders could not always be fulfilled.

The Biological and Fishery Inspecting Stations of the German Fishery Association made experiments, and expressed itself thus on the results:—

Muggelsee. Friedinedesjyee.

Biological Fishery Inspecting Station of the German Fishery Association.

Berlin, 7th April 1897.

The Police Magistrates in Hamburg prepare in their knacker yard two products, fish meal and meat meal, by means of the Podewils method. Both products are ground, but not to the consistency of dust. The experiments made with these as fodder give the best of results.

According to our analyses, the first product, meat meal, contains 5·59 per cent. water. If this product remains some time in the open air, for instance, in sacks, boxes, etc., it becomes much more hydroscopic, then it contains 10 to 11 per cent. water. Such was the result in several analyses at least. My experience with meat meal shows that the more water it contains the better it lasts, and is infinitely superior to one poor in water. The products keep just as well, and go farther. I have experimented with a little sackful, which has lain two years long in a shed, and is in no way damaged.

The second preparation, the fish meal, contains, according to my analysis, 18·43 per cent. water. This quantity of water is enormous. If one considers that a preparation of this kind is much better appreciated by fishes and hens than a dry one, this is a great advantage to start with, as it keeps as well as the meat meal. Both foods, on microscopic examination, show that they are principally composed of meat tissue, and also of bones, gristle, gelatine, etc. There is a high deposit of ash, 18·16 per cent. and 16·89 per cent. In general it is supposed that these preparations from scraps, etc., are rich in microbes, and that once wetted they easily decay. It is, however, evident that the damp meat and fish meal if kept for twenty-four hours at a temperature of 40° C., is less affected by the air than other preparations of a similar nature. I have experimented with both fish and chickens. The latter had a thick soup of boiled potatoes and dry fish and meat meal added to it, and this soup was perfectly useable in the hottest of summer weather. The hens fed with this food were in splendid condition, and there was not a single case of disease in their digestive organs, or of infection observed amongst the brood, although there were 40 to 50 hens. I believe, therefore, that a diet of meat and fish flour for hens is greatly to be recommended, and combined with other cheap diet, which costs as good as nothing, for instance potato parings, the hens keep well and lay fine eggs plentifully.

The meat meal as well as the fish meal is taken up very greedily by the hens after they get used to it, which they do in a few days. The microscopic inspection of the contents of the stomach and bowels showed further that all the meals had been thoroughly digested. As I have proved by many experiments, carp, salmon, and trout all digest boiled starch very well.

But cellulose does not appear to be digested by carp so well that a mixture of turnip is not advisable. The digestive powers of the fish (especially of breeding fish) varies; for instance, the trout can digest more albumen than the carp. To prepare a universal fish food that is also cheap is a very difficult task. After many attempts, I have arrived at the conclusion that the following is an excellent food for trout:—

40	parts	fish meal (Hamburg).
40	,,	meat meal ,,
40-60	,,	potatoes (raw, but pared).
20	,,	dry meal (fodder).
4	,,	salt.
1	,,	syrup (sugar or starch syrup).

All the constituents, with the exception of potatoes, are to be put in dry; the latter should be mixed with 75 per cent. water.

The food should be thus prepared:—

The potatoes (best pared and sliced) should be mixed with dry rye meal in the above proportions, and steamed in a steamer without any water—none on any account; then

the other ingredients are added. The syrup should be worked in gradually, so that the food does not dry too hard. The mixture can best be mixed by the so-called Wolff or American mincing machine, with crossed knife, grated mouth; a machine recommended by Director Kiedal, of Heidelberg, for the preparation of fish food This machine has the further advantage of mixing the food and turning it out in worm form, as the fish like it best. If the worm break, the mixture is too dry; if they stick, it is too wet. In the former case, not enough rye meal has been put in; in the latter case, the potatoes are too watery.

If the worms are properly prepared, they can simply be dried out of doors, when they will keep well. Before feeding, they should be thrown in the water after being carefully damped.

In order to feed the hens it is sufficient to mix boiled potatoes, etc., with rye meal, etc. Potato peelings, cabbage stalks, and hay are good. To potatoes (damp) can be added the eighth to the tenth part of meat fish meal (dry), to provide the hens with a good and nourishing food. By a diet of this kind there was produced, in March 1896, and in the same month in 1897, 450 eggs from 25 hens, thus, every hen laying an egg oftener than every second day. Does it not appear that with better feeding a higher standard will be attained?

Prof. Dr FRIEZEL.

This proves that the manufactured meal is easy of digestion. In this respect the following analyses by the experts in the German Agricultural Society prove the quantities of raw proteine found in the food produce to be quite digestible albumen.

German Agricultural Society,
Inspection Station,
Berlin, 18th April 1896.

The sample of meat meal sent on 30th March 1896, weight 2,000 gr., sealed in tins, called meat meal, manufactured in the knacker's yard at Hamburg, contains:—

5·59	per cent.	water.
94·41	,,	solids.
18·16	,,	ash.
76·25	,,	organic substance.
8·97	,,	nitrogen.
56·06	,,	raw proteine.
50·56	,,	digestible albumen.
16·75	,,	fat (extract of ether).

The fish meal contains:—

18·43	per cent.	water.
81·57	,,	solids.
16·89	,,	ashes.
64·68	,,	organic material.
9·05	,,	nitrogen.
56·56	,,	raw proteine.
49·71	,,	digestible albumen.
8.44	,,	fat (extract of ether).

Besides, it is important that these products, unlike the so-called extracted meat, contain the full strength of the animal body in nourishing salts, the great importance of which, for digestion and nourishment, is well known.

This meat meal has also found use as food for pigs. A large pig-feeding establishment has obtained good results thereby, but it was observed that meat meal should not be used in the last four weeks of the fattening period.

As to the special qualities of the blood meal lately prepared in large quantities, and its use as fodder, no experiment has been recorded. This shows on analysis the following ingredients:—

Moisture	8·29	per cent.
Fat	4·14	,,
Nitrogen	11·825	,,
Raw proteine	73·906	,,
Phosphoric acid	16·63	,,

6. *What the Business Yields.*—So long as the knacker yard was conducted by a private party, the official yield of the business does not appear to have been known. It may, perhaps, have been over-estimated, when at the end of 1882, as already mentioned, the *pro tem* municipal administration was decided on in order to obtain a supervision of the income. Since the year 1883, we have exact amounts drawn up of the profits and losses of business.

7. *The Podewils System.*—In the choice of a system it was not deemed feasible to make a leading feature of the economical utilisation of the material. In the first place, much more thought was bestowed on the sure and practicable removal of all injurious germs, etc., and on the hygienic perfection of the working gear. From that standpoint the Podewils system for the preparation of animal carcases and slaughter-house refuse was chosen, as it was specially strong in these points, and also rendered an exhaustive economic utilisation of the mass of material destined for destruction. The advantages of the Podewils system consist principally in the small amount of hand labour required. The apparatus is never again opened after the closing of the trap door when it is first filled, and is worked by means of steam at a temperature of 130° C., until it produces fat and meat meal.

The apparatus consists mainly of a cylinder with a steam jacket, for containing the pieces of the carcase, with cocks for the outlet and inlet of steam (see illustration, page 246) Inside the apparatus there is a movable roller, which breaks down material while it dries, when the apparatus is set in motion after the drawing off of the fat. After the material is dry and the cover is taken off, the apparatus itself pours out the finished meat meal.

The Podewils apparatus of the size chosen here (No. 5), is, as a rule, made to hold a charge of 3,000 kilos. raw material.

The cooking process takes four to five hours, and the drying seven to eight. As a rule the apparatus is filled up in the afternoon, so that during the night the fat can run off without the loss of working hours. The next morning, after the fat run off is put up in air-tight barrels to dry, the drying process goes on inside the apparatus, and is completed in the afternoon. This one filling and working off can be accomplished in the course of a day. Although three apparatuses are in the business, it is not usual to have more than two filled at a time, the third being kept ready for emergencies.

If an extraordinary number of orders pours into the establishment, the working power of the apparatus can be increased by night work. In December 1895, for instance, it was possible to prepare 50,000 kilos. of material in twelve days (the carcases of the poor beasts which died in the Danish vessel), although only two apparatuses were in use. Experiments have proved that if the apparatus work night and day, and time is allowed for re-filling, three charges can be arranged in 48 hours.

The Podewils system is specially to be recommended, because the whole process can be accomplished in one and the same apparatus and is air-tight all through, because it has special drying and grinding arrangements, because there are no scraps left over, because finally, glutinous meat juice is dried up with other refuse.

Great stress must be laid on the drying up of the gluey substance, because the worst results have been obtained from it. At the close of the cooking process it is in a perfectly sterilised condition, but it is well known that it forms a favourable breeding ground for new infectious germs, and soon decomposes in the air. Difficulties of many kinds arose in the efforts to get rid of the glue water without deadly damage. In the manufacture of glue the glue water is not used. It forms, on evaporation, a gelatinous mass, which still contains a high percentage of water; is not pulverised, but is strongly hydroscopic. This pulpy mass, known as "barrel glue," only leaves a small residue, but the Podewils apparatus enables the gluey substance to be dried up with the other matter, leaving no residue whatever, hence it is an admirable system.

Moreover, the gluey matter can be removed from the Podewils apparatus at pleasure for the purposes of further use. The apparatus is so arranged that it must not dry up the glue, but that the glue is dried simultaneously with the other material. The separate drying of this glue can naturally only be recommended if the glue obtained yields a value greater than that yielded in the meat meal. Its loss to the meat meal is not only a quantitive but a qualitative one, because it is just in this substance that the strength of the animal body is contained, for in it are the soluble nourishing salts which go far to make the meat meal unexcelled as a fodder, and render it superior to the goods of a similar class made from the refuse of meat extract, in which there is none of this gelatinous substance.

Most satisfactory progress has been made in the calling of the knacker in the course of the last few years, especially in technical working arrangements and fittings. It is all the more to be hoped for, in the public interests, that these improvements will meet with general acceptance, and crowd out the very primitive methods that have until now held sway. That this is possible, even in this country, has been proved in several provincial districts in which of late technical establishments of this kind have been erected, and are being carried on with best results.

Anyone interested in the business will be conducted over the Municipal Knacker Yard in Hamburg. For this, a special permit is not necessary. The staff have been instructed to give the necessary explanations.

The most suitable time for visitors is between 2 and 4 o'clock in the afternoon, when, as a rule, the apparatuses are being loaded and unloaded.

Appendix.

Business Regulations for the Municipal Knacker Yard in Hamburg.

1. *Purpose of Establishment.*—The Municipal Knacker Yard is to be conducted at the account and risk of the Hamburg State, and is for the harmless removal of animal carcases or parts thereof, and also of all tainted and rotten goods, by the most practicable utilisation of these, the production of material for agricultural and technical purposes.

The knacker's yard also takes in hand the catching and bringing in and killing of strayed dogs and cats, in accordance with the Dog Laws of 9th July, 1894, and the regulations respecting Homeless Cats of 11th November, 1892, and finally the keeping and tending of all lost animals.

For the keeping and observing of diseased and suspected animals there are also stables and stalls set aside in special observation stalls.

2. *Local Responsibilities.*—Its circle of operations extend over the radius and under the control of the Municipal Police Magistrates, by whom the establishment is managed.

It is only in special cases that the knacker's yard is under the control of the responsible magistrates in the rest of the State. If an owner of beasts in one of the surrounding country parishes wishes some carcases removed to the knacker's yard, a simple notification of the fact is all that is necessary.

3. *Supervision of Employees.*—This is done by the Police Magistrates (see 7).

The veterinary supervision of the business is in the hands of the State Vet., the oversight of the machinery in those of the Head Official of the Steam Boiler Inspection Office.

The manager of the business is appointed by the magistrates as "Manager of Municipal Knacker Yard," who is obliged to live on the premises. He is assisted by an overseer and the requisite number of engineers, vanmen, and labourers. The overseer, vanmen, and labourers are also required to live on the premises.

4. *Payment of Staff. Keeping of Horses*—The overseer and staff are paid out of the funds of the knacker's yard.

The horses required for the business are kept up out of the working funds of the business. The manager is expected to look after the horses, and see that they receive each the rations allowed them.

5. *Duties of Manager.*—The manager is responsible for the ordinary management of the knacker yard, and must conduct it according to legal regulations regarding it. He has complete charge of the rest of the staff, and is responsible for this work. In order to be able to supervise the engineers, he must have a sufficient knowledge of machinery and how to manage it.

The manager must not leave the knacker's yard during working hours, unless in a business capacity.

6. *Duties of the Overseer.*—The overseer supervises the vanmen and labourers, but is also expected to hold himself in readiness to do any of the work of the yard that is required of him.

He is also obliged to lend his aid to any outside job in Hamburg required of him by the magistrates, and is guaranteed a remuneration of 100 marks in every case (such as help in fitting up machinery, etc., in some other department of the municipality's undertakings).

7. *Appointment of the Assistants.*—The overseer and the engineers are appointed at a month's notice on each side, that of vanmen and labourers at a week's notice. The engaging and dismissing of vanmen and labourers is part of the duty of the manager.

These are expected to do their work conscientiously, and to render implicit obedience to the instructions of those in authority. They are expected to go about their work in a sober, quiet, orderly way. They are forbidden by the police magistrates to accept presents or remuneration of any kind for their work. They must carry on no other occupation while in the service of the knacker yard They must not carry out any private orders for the persons with whom they come in contact in their business. They are responsible for

every accident caused by personal carelessness. They are bound to render assistance to the overseer in the execution of any piece of work required of him by the Municipality of Hamburg (see 6). Each man to be paid at least 10 marks in every case.

Disobedience to the rules laid down in the magisterial regulations can be punished by immediate dismissal, and by fines up to 10 marks. The employees must bind themselves by written agreement on entering the business to keep the regulations to the best of their ability.

8. *Working Hours.*—The regular working hours of the Knacker Yard working days are from 6 in the morning till 7 at night, with $1\frac{1}{2}$ hours rest at midday, and half an hour in the forenoon, and half an hour in the afternoon. The employees must not claim to adhere strictly to these hours, but are required to work overtime when necessary, and also be asked to give up some of their meal hours. They will only be paid for overtime when required to work at night, when they will be paid at half as much again as the scale for their day's work. The night in this case counts from 10 in the night till 4 in the morning. If the night work only lasts some of the night, the workmen are paid by the hour; if it last all the night (10 till 4), they are paid by the night.

On Sundays and holidays the work is as limited as possible.

9. *Keeping up of the Building and Stock. Watching of the Establishment.*—The Knacker's Yard, its business, buildings, and stock, are all the property of the State of Hamburg.

The buildings and appliances must at all times be kept in perfect order and thoroughly clean. The staff is expected to undertake all necessary repairs and additions, under the direction of the manager.

The individual rooms in the building must be used for the purposes for which they are intended. As much care as possible must be taken in the use of buildings, appliances, and utensils, and the materials required for working with, must be used with every economy.

A watch dog must be kept; it should be on a chain through the day, otherwise no dogs must be kept in the establishment.

10. *Cartage, etc., to the Knacker Yard in General. Issue of Certificates.*—The Knacker Yard undertakes to remove by means of its own conveyances, all animals, carcases, etc., to be treated by them, and must keep on the premises a sufficient number of waggons, etc., for this purpose.

With respect to the conveyances used, three various categories come under consideration:—

1. The animals and parts thereof rejected by the Official Inspectors in the slaughter-house; further, those fishes and fish guts, etc., from the central fish market.

2. The carcases of animals which have fallen down dead in the public streets and in their stalls, and any large animals that have died in transport, also the larger portions of rotten and tainted goods.

3. Living dogs and cats, smaller animal carcases, and the rest of the tainted and rotten goods. When the services of the Knacker yard are wanted, notification must either be made personally at any of the police stations, from whence it will be telegraphed to the yard, or directly by telephone, or by a written notice to be delivered to the police magistrates.

The manager must see that all orders are carried out promptly, and at least within twenty-four hours after they are received.

The Knacker yard may not convey tainted or rotten goods from any shop, etc., until the police magistrates responsible for public health have received notification of the state of the goods, and have given their official certificate.

The manager may remove tainted goods, etc., from the docks without paying customs duties, provided he sends an official notice to the Custom House Authorities that the goods to be removed will not be used for human consumption, but are to be destroyed.

11. *Business with the Slaughter House, Cattle Yard, and Fish Market.*—For removal from the slaughter-house and cattle yard of rejected meat, etc., the iron tank waggons, specially constructed for the purpose, should be used, and these must be air-tight and securely locked. Both slaughter-house and knacker yard should have a key for each.

The manager of the knacker yard must take care as soon as a tank waggon is ready for the reception of the rejected goods, and notification of this fact is received from the slaughter-house, that it must be fetched at once and another empty waggon left in its place.

The same routine must be observed with the fish market.

Open waggons may be used in removing animal carcases from the cattle yard, if when loaded they are carefully covered with tarpaulin.

12. *Conveyance of large Carcases and Diseased Beasts from Streets and Stables.*—Carcases of animals falling in the public streets must be removed with all possible haste. Within the districts of old town, new town (with the exception of the Free Port district), St Paul, and St George, the firm of Messrs J. W. Schlute & Son, Peter Kirche, 2, are commissioned by the police to remove all such animals that fall during the hours of 8 a.m. and 8 p.m. This firm removes the carcases in the carcase transport waggons to a place arranged for by the authorities, from whence the knacker yard, previously notified, fetches it with all possible speed. In all other cases the knacker yard fetches the carcases direct from the public streets with all despatch.

Carcases should, as a rule, be fetched from the stables before 7 a.m., or after dusk.

If a diseased animal is to be fetched which cannot be killed in its stall, the "ambulance" waggon of the Hamburg Society for the Prevention of Cruelty to Animals of 1841 should be used.

In every case the carcases in the transport waggons should be covered with tarpaulin. This holds good also for the conveyance of tainted and rotten goods in open waggons and carts.

13. *Conveyance of small Beasts and Carcases.*—Living cats and dogs, small carcases, and the great majority of tainted goods should be removed in closed box waggons, divided into cells, by means of a regular door-to-door round. The number of these waggons is determined by necessity. Every waggon should have a district assigned to it.

As each waggon goes out, the waggoner should receive from the manager a paper, on which he enters each transaction as he goes along. All the waggons must first drive to Police Station No. 23, the telegraphic centre for the knacker yard, and there compare their papers with the telegraphic book for the knacker yard, and, if necessary, correct them, and also enter any belated orders. They then must go into their districts without waste of time, and get

through their work in proper order. They are also obliged to undertake any orders which may turn up when in their district, and before leaving the district to telegraph from the police station of the district to the central station to inquire if any more orders have come in. The orders they receive in the district must at once be entered on their paper, and, if possible, carried out the same day. They must drive past all places where dogs are collected each day. They must always show their paper when fetching away from either police or private parties.

On the completion of their round, the waggoners must drive the shortest way back to the knacker yard, and there hand over all goods to the overseer, or a representative appointed by him, checking each article on the paper as they go along.

The paper is then to be given up to the manager, who gives orders as to each commission which has not been carried out, and who enters all remaining orders into the paper for next day.

The papers must be handed up to the authorities at the end of every month to be looked over.

Special arrangements must be made to remove carcases from the public water courses.

14. *Treatment of Living Animals in Transit.*—Waggoners are, as a rule, strictly forbidden to kill living animals when in transit. Exceptions are only made when an animal is so wounded or diseased that the killing of it would be the most merciful thing to do. In this case slaughter should be undertaken in the presence of spectators. Any tormenting or cruelty to the animals will be strictly punished, or instant dismissal will follow.

15. *Cat Catching.*—The knacker yard is expected to carry out the laws against stray cats, drawn up on the 11th November 1892, consequently its servants have the right to enter public places and private gardens, on producing a certificate of their business to the owners. For this purpose only baited cat traps may be used, in which the cats are firmly secured but are not hurt. The setting of the traps and the fetching of the cats must be done by the waggoners on their daily rounds (see 13). The waggoners must empty the cats from the traps into sacks, in which they must be kept while being conveyed in cell waggons to the slaughter-house. The cats must be killed at once.

Cat traps should, as a rule, only be set between March 1st and October 31st.

16. *Catching of Dogs.*—Catching of dogs in the public streets is to be avoided as much as possible. Only when in pursuit of a mad dog may the knacker yard assistants invade private ground.

In places where there is a great deal of traffic, market places during market time, in the vicinity of funerals or public shows or processions, before schools, at the opening and closing of school hours, dog catching should be avoided, if possible. In all cases the morning hours should be avoided.

The dogs that may be taken up are—

1. According to par. 6 of the Dog Duties Law, 9th July 1894, such dogs as at the end of the month of January have had no tax paid for them.

2. According to power 38 of the Epidemics Laws, 23rd June 1880, and 1st May 1894, all dogs which are running about without muzzles during the dog days, or during a period stipulated by the police.

The dogs caught are to be conveyed to the knacker's yard in the celled waggons recommended in par. 13.

Until a better mode is fixed on, dogs are to be caught with an easily bent elastic running noose. In the case of small dogs the use of this noose should be avoided, if possible.

The dogs should be caught with the greatest possible despatch, without cruelty or any unnecessary onlookers. Dogs that are being led, and draught dogs which are in harness, must not be touched. In such cases the nearest policeman should be informed.

Only practised persons may catch dogs. These must be dressed in livery, be known by their cap, and must not be impolite or domineering to the general public.

In all disturbances, the knacker yard officials are entitled to assistance from the police officials.

17. *Treatment of Dogs in the Knacker Yard.*—The dogs in the knacker yard kennels are to be kept separate as much as possible. These must be provided with dry straw and fresh water, and always be kept thoroughly clean. The dogs must be fed at least twice a day. Uncooked meat must not be given them.

A slate must be hung in every kennel, describing the breed, colour of each dog, how it was brought in, the day it was brought in, where it came from, the number, etc. The giving up of such dogs, and the fee to be paid for their keep is to be settled by the regulations of the Dog Duties Laws of 9th July 1894, and in divided cases by the responsible magistrates. If and under what conditions a dog may be let out during the dog days is a matter to be settled by a consultation of the Dog Laws.

The fines paid by the owners of the dogs are to be handed up to the authorities by the manager on the next working day after they are paid, and the costs of fodder, etc., are to be notified twice monthly.

All dogs not reclaimed within the period arranged by the authorities must be killed; their collars and muzzles are to be destroyed, and the medal, with their number, handed over monthly to the authorities.

18. *Killing of the Animals.*—Unless exceptional circumstances occur, the animals to be killed in the knacker yard must be put to death in the slaughter-house of the establishment, the doors of which have to be kept shut during the process. The presence of private parties is forbidden.

The animals are to be led to death in the slaughter-house singly.

Killing has to be accomplished in the shortest and least painful way, according to the special instructions of the official veterinary surgeon.

19. *Slaughter-house management.*—Hair, hides, skin, horse shoes, etc., may be taken from the bodies of animals not infected with any disease, and sold for as much as they are worth.

Before the carcases are taken to the Podewils apparatus to be destroyed, they must be cut up to a suitable size in the slaughter-house first. The meat shall not be stored in the slaughter-house if it can be avoided.

The sewage from the slaughter-house shall only be led off into special tanks, which are then led off in pipes, and emptied into the Podewils apparatus.

The burying of animal carcases, or parts of such, the giving away of meat in the establishment, and their use as human food, is forbidden.

20. *Working of the Podewils Apparatus.*—The Podewils apparatuses are usually loaded with 40 centners of raw material at one charge. In case of necessity a larger quantity (60 centners) may be permitted.

During the steaming process, which may be reckoned on as about four or five hours, steam is allowed into the interior of the apparatus at a pressure of three atmospheres. After two hours' boiling, to loosen the bones from the meat, the bruising roller in the centre of the apparatus is set in rotation after a short time. After cooking is over the meat is allowed to stand for some hours, so as to let the fat rise to the top for its removal. For this it is better to use the night hours. It is, therefore, best to begin and cook in the closing hours of the afternoons of working days, and only deviate from this course in exceptional cases.

After the fat is separated, it must be led off through pipes for the purpose into the closed cylindrical barrel for its reception. By this procedure one must carefully see that no fat remains behind in the apparatus, and, therefore, to go on running it off until the noise in the pipes for several minutes shows that glue water has begun to run through them. The contents of the fat barrel shall be washed twice—two minutes with cold water by means of the rose-shaped cover before the fat is let off through the cock. The glue water remaining behind after the fat is drawn off into the barrel, is led back into the Podewils apparatus through connecting pipes, and the apparatus may again be recharged.

As soon as the fat is drawn off from the apparatus, the latter must be heated for the drying and powdering process, and again set in motion. There must now only be steam led into the steam jacket of the apparatus (pressure of 3 atmos.) After a six hours' process the manufacture should be tested by the valve for the purpose, and not stopped until the sample shows a sufficiently dried carcase meal.

Before emptying, the manhole must be opened and the machine again set in motion to shake out the contents.

Any opening of the manhole during boiling, drawing off of the fat, or drying, is forbidden, unless the machine goes out of gear.

The vapour from the interior of the apparatus is to be condensed by means of an air pump during the cooking as well as during the drying process, and the condensed water led into the public sewers. If the air pump will not act, because of some mal-adjustment, the vapour may be permitted to escape through the chimney. The condensed water produced by the use of steam in the heating of the jacket must be collected in the reservoir for the purpose, and used for cleansing purposes.

The meat meal emptied out of the apparatus must be taken at once to the room where it is be stored, and here run through a sieve. The pieces remaining behind that are too large must be put again into the apparatus and again subjected to the process, in charges of from 15-20 centners, being first steamed for a quarter of an hour, and then submitted to the drying and crumbling process for about two hours. If there are still bones left behind, they must go in along with another charge of raw material.

21. *Engineers.*—The feeding and watching the steam boiler, pipes, valves, cocks, and other machinery is the sole work of the engineers. Small repairs must be done by the engineers themselves, if possible. Such injuries to the machinery as they cannot put right must be reported to the manager at once, who must, in turn, lay the matter before his magistrates, and if danger is apprehended, to apprise the over official of the steam boiling inspection office (see 3).

Every quarter, a thorough inspection of the entire apparatus must be made by the engineers, and it must be reported upon.

Care must be taken in the heating of the machine and in the condensing of the vapour to be as economical as possible with coal and water.

In the colder seasons the engineers are also responsible for the regular heating (by steam) of the dwelling houses of the men and stables for the animals.

22. *Conveyance and Treatment of Diseased Animals and the Carcases of such. Disinfection Instructions.*—In the transport of diseased animals and their carcases, the instructions of the official veterinary surgeon must be strictly carried out.

If the vet. thinks a post mortem examination necessary, the staff of the establishment must be prepared to render assistance. The manager must see to the good condition of the instruments used.

The dissecting table and instruments may be put at the disposal of private vets. provided they hold themselves responsible for repairs. In such cases, also, the staff of the establishment are expected to render assistance.

The carcases of animals that have died, or had to be killed because of infectious disease (not usually dissected), unless officially ordered otherwise, are destroyed unskinned, and not cut up. If the animals are too large to go into the Podewils apparatus whole, they must be disinfected in a digester for the purpose, which must have a lid as large in diameter as the cylinder of the apparatus.

If it is not discovered that the animals or carcases are diseased until they are brought into the establishment, the manager must at once inform his superior veterinary surgeon of the town.

Those of the staff who come in contact with animals or carcases infected with an epidemic, must afterwards take a bath in the bathroom reserved for the purpose, and change their clothes. The infected clothes must be sent to the public disinfection works to be disinfected.

Animals suspected of an epidemic can only be put into the observation stalls provided for the purpose. The stable refuse is to be collected in a pit, and disinfected before it is led into the public sewers.

The knacker yard, and also, perhaps, the public disinfection establishment, have, when ordered by the veterinary officer, to undertake the disinfection of such private stables in which infectious animal epidemics have been discovered.

23. *Treatment of Homeless Dogs.*—The establishment is obliged to undertake the care of homeless dogs. These must be brought into the general kennel, for the observation stalls are only intended for other animals. Wherever there are animals suspected of epidemic, these homeless dogs must be strictly kept away from them.

24. *Entrance of the Establishment.*—No one is admitted except on business. Anyone coming after a strayed animal is only permitted to enter the stable where the animal they are in search of is stalled, and into no other part of it.

Such persons as are interested in the technical operations of the place may see over it in the company of the manager and one of his assistants. All direct explanations may be given then.

25. *Utilisation of the Products.*—The utilisation of the products obtained in the establishment is not generally left to the manager, but is taken in hand by the magistrates in charge of the establishment. The manager may, however, occasionally conduct small transactions direct, in cases where there is a fixed price. The goods sold are delivered to the buyer, along with a bill of delivery, and a statement that the goods have been received. The receipts, printed according to a given formula, with consecutive numbers and with a coupon in block, are to be sent every week to the office, which will send out accounts if payment does not follow.

Payments are to be made into the police exchequer. The manager is authorised to send out receipts only when he is sure of payment.

26. *Book-keeping.*—The manager of the knacker yard has to keep a special ledger, into which he must enter all his proceedings in chronological order, after a given formula.

A for dogs.
B for the other objects.

Abstracts from this book must be made every two days, and sent up at the end of each month to the magistrates, the accounts being drawn up to the fifth of each month for the preceeding month. The veterinary officer must also have a statement sent him. The manager must also register the current business profit in a ledger.

All these ledgers must be laid before the magistrates at the beginning and middle of every month.

The head engineer has to keep a day book, in which he has to enter the time taken in steaming from the heating-up time, the time steam is let off, any special circumstances, the getting in of coal, and the amount of coal and water used daily. This day book must be shown to the manager every day, and is to be handed up with the other ledgers to the authorities twice a month.

Mutton (American Points).—*Parts of Mutton.*—

Neck, scrag end—the two necks are called a chine.
Neck, best end.
Shoulder.
Breast.
Loin, best end—both loins are called a saddle.
Loin, chump end.
Flank.
Leg.

The best mutton is small boned, short legged, plump and the meat finely grained, the leg bones clear white, the scored skin on the fore quarters nearly red. The fat is abundant, white, clear, and solid. When it is yellow, the meat is rank and of a bad quality. The lean is of a dark rather than of a bright hue, juicy and firm.

New York City slaughters over 2,000,000 sheep and lambs per year.

A full grown sheep dressed weighs from 60 to 90 pounds, and yields 60 per cent. of available food. Mutton, like beef, is greatly improved by ripening. It loses in cooking about one-third its weight.

The flesh of a young sheep is called lamb until it is one year old. It is then termed mutton and becomes less tender and delicate, though in England experienced judges do not consider it to be in perfection until it is nearly, or quite five years old. The exquisite flavour of English and Scotch mutton comes from the aromatic wild herbs in their pastures. Ram mutton is darker and coarser grained, the fat less white, the flesh spongy and rank. Lean mutton is generally inferior; so also is mutton having yellowish fat with flabby, bluish or stringy meat.

The fore quarters are generally sold from one-third to one-half less than the hind quarters. The leg is the choice piece and should bring a higher price, as it has more meat in proportion to the bone than any part of the animal.

The best chops are from the middle of the loin; they are also cut from the leg and from the rear end of the neck. Chops should be cut not less than one-half inch thick and not over fat. Rib chops are sometimes cut from the breast. The breast and shoulder are good roasting pieces with the shoulder blade taken out.

The haunch consists of the leg and the part of the loin adjoining it; the saddle, of the two loins together, or the undivided back of the sheep. These last are always sold as roasts. The neck is sometimes a roasting piece, but is more generally soup meat. The scrag, or that part which joins the head is seldom sold for any other purpose than soup pieces. The loin and the leg are occasionally cured and smoked like ham or bacon.

Cutlets are taken from the thick end of the loin and sometimes from the best end of the neck. Mutton kidneys sell readily.

Mutton Hams.—As mutton takes the salt very rapidly, great care must be exercised not to get the hams over salt; select hind legs, cut off feet.

Make a pickle sufficient for requirements of salt dissolved in water to salinometer strength 65°, and to each ten gallons of this pickle, add ½ lb. saltpetre, ½ lb. antiseptic, 1 lb. moist sugar; immerse legs in this pickle for seven days, then take out and pack closely together on slab in cool dark place, and leave them for eight days; after which wipe over with damp cloth wrung out of hot water, and hang in cool dry place to dry, when they are ready for use.

Mutton (to Corn).—see Corn Beef, No. 2 Recipé.

Mutton Sausages.—The mutton may be either home grown or frozen. If the latter, however, care should be taken to add the sausage meal very slowly. Should a cheaper sausage than what can be made from the following recipé be wanted, all that is necessary is to increase the proportions of pressed bread and sausage meal, the seasoning being also increased *pro rata.*

10 lbs. mutton.
1 lb. pork.
1 ,, sausage meal.
1 ,, pressed bread.
1½ ozs. food preservative (dry antiseptic).
7½ ,, seasoning.
2 quarts fresh sheep's blood.

The seasoning may be made up as follows:—

6 lbs. salt.
1 lb. ground white pepper.
1 ,, ground ginger.
½ ,, savory.
½ ,, ground coriander seeds.
1 oz. rubbed parsley.

Cut the mutton and pork into small pieces, and mix the sausage meal and bread together on a table, then put into mincing machine, adding some water at the same time. Add the other ingredients, and chop till the mixture is moderately fine. Fill into sheep casings and link in the ordinary manner. Plunge them into cold water in a copper or large pot, and gradually heat to nearly boiling point (about 200° Fahr.) Withdraw the heat and allow them to cool in the water. Take them out, wipe, and hang them up to dry. When required for use they should be fried in a little lard.

Sheep's blood should be obtained at the time the sheep is being slaughtered, and should be stirred at once. Add to every gallon—

1 oz. salt.
1 ,, food preservative.
2 gills warm water.

Seasoning may be added to suit the tastes of different localities by substituting marjoram or sage for savory.

NATAL.—Cattle are found in all parts, but principally in the midland and northern divisions of the Colony. There were 232,000 head altogether in 1898 (as compared with 737,000 in 1896), a third of which belonged to the native population. The enormous decrease in 1898 was due to the ravages of rinderpest. Cattle are the principal means of transport away from the railways, and are at present more valuable on this account than for beef or milk. The average price for horned cattle in 1898 was £10, 6s. 7d., of milch cows £12, 16s., of draught oxen £12, 10s., and of slaughter oxen £14, the prices being much higher than in 1897. The disease to which they are most liable is lung sickness, which is especially fatal in seasons of great heat and moisture. Provision for winter feeding is a source of considerable difficulty. It is made in three ways (1) by cultivation of green crops under irrigation; (2) by storing of properly made nutritious hay; and (3) by ensilage. Losses occur in winter from want of sufficient protection against the weather. In the remaining eight or nine months of the year pasture is sufficient and stock require no shelter.

Many of the above remarks apply to horses also; the breed of horses has improved of late. There is a steady demand for good horses both within and outside the Colony; the Imperial Government gives £35 for remounts, and the Natal Mounted Police £25. There is also a considerable demand for mules, especially on the coast, on sugar estates, the average price being £15, 13s. 6d. Horses thrive well upon the hills and high pastures, but in the low-lying districts they are very subject, in the summer, to a horse-sickness which rapidly kills them. They are to some extent used for field and draught work. The average market price for draught horses in 1898 was £21, 3s., and for saddle horses £17, 8s., as compared with £28, 6s. and £17, 2s. in 1897.

Sheep farming is the most important industry of the Colony, and is mainly carried on in the midlands and uplands. In 1898 there were 538,000 wool-bearing sheep belonging to the European population (as against 649,000 in 1897), besides a few sheep of other kinds. The average market price of the former was £1, and of the latter 18s. 6d. per head. About 1,747,000 pounds of wool were produced in Natal in 1898, as against 1,520,000 in 1897. Altogether, sheep farming seems to offer very fair chances of success to men of capital, and efforts are now being made by use of wire fencing, etc., to conduct it on more scientific principles. A scab law is in force.

Angora goats thrive on high and dry lands in the upper districts of Dundee, Newcastle, and Klip River, and in parts unsuitable for sheep. They do not require so much attention as sheep, and their hair is a valuable article of export. Their numbers increased from 56,000 in 1887 to 85,000 in 1898. The average price of an angora goat in 1898 was 16s. 5d. Large quantities of hair are exported every year. There are also large numbers of common goats belonging to the native population.

Dairy farming is remunerative, and should be carried on to a much greater extent than it is. The quantity of butter made is not enough for home consumption, and considerable quantities are imported. Very little cheese is made, so that large quantities have to be imported to meet the demands of the Colony. The quantity of bacon also which is produced is not sufficient for home consumption; the average market price is 10d. per lb. A dairy expert has been appointed.

The Colony largely imports all kinds of preserved provisions, and chilled or frozen beef, veal, and mutton.

National Federation of Meat Traders' Association.—This federation was the outcome of a butcher's society formed in Leeds in 1882, and since that date the great advantages which have been obtained by those in the meat trades, by the combination, have led many other associations to be formed. The result is that the following associations are now affiliated together in one large body.

Accrington.	Fleetwood.	Newport, Mon.
Ashton-under-Lyne.	Grimsby.	Northampton.
Bacup.	Halifax.	Norwich.
Bangor, N.W.	Huddersfield.	North Wales.
Barnsley.	Hull.	Nottingham.
Birkenhead.	Horwich.	Oldham.
Bath.	Ipswich.	Paisley.
Bedford.	Keighley.	Portsmouth.
Belfast.	Kidderminster.	Preston.
Bridlington.	Kings Lynn.	Ramsbottom.
Birmingham.	Lancaster.	Rawtenstall.
,, Wholesale.	Leamington.	Reading.
Blackpool.	Leeds.	Rhondda.
Bolton.	,, (S.O. & O.).	Rochdale.
Brighouse.	,, (Retail).	Rotherham.
Brighton.	Leicester.	Scarborough.
Bristol.	Lincoln.	Sheffield.
Burton-on-Trent.	Liverpool.	,, (Pork).
Bury.	,, (Foreign Cattle).	Shipley.
Cambridge.	,, Pork,	Southampton.
Cardiff.	London (Butchers' Trade).	Southport.
Carlisle.		South Shields.
Cheltenham.	London (Foreign Cattle).	Sowerby Bridge.
Chesterfield.		Stockton-on-Tees.
Colne.	London (Central Markets).	Staleybridge.
Colchester.		Swansea.
Coventry.	London (Metro. Cattle and Sheep).	St Helens.
Chorley.		Wakefield.
Crewe.	Leigh and Bedford.	Walsall.
Darwen.	Maidstone.	Warrington.
Derby.	Manchester.	West Bromwich.
Dewsbury.	,, (Pork).	West Hartlepool.
Doncaster.	,, (Wholesale).	Westmoreland.
Douglas, I.O.M.	Midland (Pork).	Wigan.
Dublin.	Middleton.	Wolverhampton.
Eastbourne.	Mansfield.	
Exeter.	Nelson.	

In correspondence with following Associations:—

Aberdare.	Elland.	Middlesbrough.
Aberdeen.	Glasgow.	Mold.
Ayr.	,, (U. Fleshers).	Nottingham (Pork).
Banbury.	,, (Live Stock).	Perth.
Barrow.	Goole.	Plymouth.
Barry Dock.	Grantham.	Radcliffe.

 NATIONAL FEDERATION OF MEAT TRADERS' ASSOCIATION.

In correspondence with following Associations.—cont.

Blackburn.	Greenock.	Ripon.
Bradford (Pork).	Great Yarmouth.	Stockport.
Bournemouth.	Hartlepool (E).	Stoke-on-Trent.
Brynmawr.	Haslingden.	Sunderland.
Chepstow.	Hawick.	Todmorden.
Chester.	Holmfirth.	Tyldesley.
Darlington.	Hereford.	Wakefield (Cattle Dealers).
Devonport.	Hyde.	Whitehaven.
Dublin (Irish Cattle).	Kendal.	Worksop.
Dukinfield.	Llandudno.	Wrexham.
Dundee.	London (Pork).	
Edinburgh.	Leominster.	
	Merthyr Tydvil.	

The financial statement for 1900 shows the money at the disposal of the federation.

Statement of Income and Expenditure for Twelve Months ending 31st December 1900.

Dec. 31st, 1900— Expenditure.		
To Advertising—Meat Trades' Journal		£15 8 7
,, Printing and Stationery - -	£29 8 1	
,, ,, Special, *re* Incorporation	20 8 10	
		49 16 11
,, Hire of Premises for Meetings -		3 18 6
,, Special Reporting Fees - -		6 6 0
,, Audit Fee - - - - -		1 1 0
,, Insurance - - - - - -		1 10 0
,, Legal Charges		
W. Rudd - - - - -	£2 5 6	
W. T. Ricketts & Son, on account of Incorporation -	50 0 0	
		52 5 6
,, Secretary's Salary - - -		104 0 0
,, Travelling Expenses—		
W. Coggan, President - -	£10 15 0	
W. Ramsden, Hon. Treasurer	14 2 3	
Wm. Field - - - - -	2 0 0	
T. Myers - - - - -	2 10 0	
J. R. Smith - - - - -	2 10 0	
A. G. Abbott - - - - -	0 15 0	
W. Chapman - - - - -	2 3 0	
M. Morley - - - - -	1 19 6	
F. Redman - - - - -	1 10 0	
Secretary - - - - -	28 15 10	
		67 0 7
,, Telegrams, Postages, etc. - -		22 13 10
,, Balance—In Bank - - -	21 2 0	
Cash in hand - -	7 2 0	
		28 4 0
NOTE.—This Balance of £28, 4s. is subject to an outstanding amount of £18, being balance of Solicitor's charges in connection with the Incorporation.		
		£352 4 11

Dec. 31st, 1899— Income.		
By Cash at Bankers—Hill & Son, Liverpool		£61 0 5
Dec. 31st, 1900—		
By Subscriptions and Donations -	£269 15 0	
,, ,, Honorary Members	7 7 0	
,, Affiliation Fees - - - - -	13 13 0	
		290 15 0
,, Sale of Reports (1897–98) - -		0 9 6
		£352 4 11
By Balance brought down - - -		£28 4 0

Legal Defence Fund.

Dec. 31st, 1900—		
To Contributions to—		
King's Lynn - - - - -	£140 0 0	
Scarborough - - - - -	100 0 0	
		£240 0 0
,, Balance carried down - - -		147 3 3
		£387 3 3

Legal Defence Fund.—cont.

Dec. 31st, 1899—			
By Balance brought forward from last a/c.			£129 3 2
Dec. 31st, 1900—			
By Levy, 31st Jan. 1900 - - -			203 9 0
,, Proceeds of Draw for Portrait—Duke of Wellington - - (*Presented by J. Crabtree, of Birkenhead*)		£76 4 0	
Less Charges as under—			
King—Renovating	£6 10 0		
Insurance - - -	2 10 0		
Electrotype Block -	0 18 6		
Advertising - - -	5 17 6		
Printing - - -	2 8 10		
Carriage, Postages, etc. -	3 8 1		
		21 12 11	
			54 11 1
			£387 3 3
Dec. 31st, 1900—			
By Balance brought down - - -			£147 3 3

W. COGGAN, Pres.
W. RAMSDEN, Hon. Treas.
W. PAYNE, Secy.
80 St Andrew Street,
Liverpool, 31st. Jan. 1901.

I have compared the above Accounts of Receipts and Payments with the Bank Pass Book and Vouchers produced, and I certify the same to be in accordance therewith.—W. R. MILLER,
Chartered Accountant,
21 North John Street, Liverpool.

The Rules are as follows (as revised and provisionally adopted at general meeting on 10th August, 1892):—

1. *Name and constitution.*—That the name of this association be "The National Federation of Butchers' and Meat Traders' Association," hereinafter called the Federation, which shall consist of associations duly proposed and admitted as provided for by rule 5.

2. *Offices.*—That the address of the Federation be the offices of *The Meat Trades' Journal*, or as may be determined at any time by the executive of the Federation.

3. *Objects.*—That the objects of the Federation shall be to watch, through its executive, any proceedings affecting the vested rights, property, character, interests, and privileges of the trades concerned, viz.:—

1. Imperial matters, legislation, compensation for disturbance of existing trade facilities, which are not opposed to utility, and direct parliamentary representation of the trade.
2. Opposition to further, and relaxation of existing restrictions, on the importation of foreign live stock; also to increase the number of landing stages for foreign animals, with a view to facilitate their distribution. To watch over any special legislation in regard to the sale of foreign meat, and also the laws controlling meat inspection.
3. Improved transit of cattle, sheep, and pigs.
4. Responsibility for bruises and damages.
5. Reductions of railway rates.
6. Regulations *re* movements of cattle, representations on committees and trusts having markets and slaughter-houses under their charge.
7. Conflicting regulations of local and other authorities.
8. Irish importations.

4. *Meetings of the Federation.*—That the Federation shall meet twice annually, at such hours as the executive shall appoint or sanction, and that each meeting shall be called by circular, fourteen days' notice to be given. That the executive shall have power at any time to call a special general

meeting of the members, by circular, stating the object of such meeting. The decisions of such meetings duly summoned shall be binding upon all the members.

5. *Admission of Members.*—That no association shall be admitted as members of the Federation unless proposed to the Executive by a member, and approved of by them, and shall pay an affiliation fee of one guinea, and such newly-admitted association shall not be entitled to the protection of the Federation until such membership has existed one month.

6. *Contributions.*—(*a*) That the maximum subscription shall be £10 per annum for any Association numbering over 200 members, if they so desire to limit their payment. (*b*) That the minimum annual subscription be £1. (*c*) That in order to embrace all existing associations in the United Kingdom, any association which is not in a financial position to pay 1s. per member, shall be affiliated on the payment of a sum considered reasonable by the executive.

7. *Voting Power.*—The voting power of affiliated associations shall be one vote for every twenty members paid for.

8. *Executive.*—The executive of the Federation shall consist of the president, vice-presidents, treasurer, and secretary of the Federation, and four delegates elected by the individual associations affiliated with the Federation. Seven to form a quorum.

9 *Election of Officers.*—The president, vice-presidents, treasurer, and secretary shall be elected at the annual general meeting, notice of which shall be given to the associations affiliated fourteen days prior to the date fixed for the holding of the said annual meeting.

Nominations for the elections of officers of the executive shall be made and forwarded in writing to the secretary not later than one week prior to the date of general meeting. The names of the members so nominated to be published in the printed minutes of such meeting, and also in *the Meat Trades' Journal.*

The reasonable expenses of the president, treasurer, and secretary, in attending the annual, half-yearly, and special meetings of the Federation, shall be defrayed from the general funds.

10. *Delegates to Executive.*—Affiliated associations may send one delegate for the first fifty members or part thereof, and in addition one delegate for each succeeding twenty members.

11. *Notification of Delegates to Secretary.*—Each local secretary shall, previous to the annual general meeting of the Federation, notify the secretary, giving the names and addresses of the delegates elected to attend. Delegates attending such meeting can exercise the right to vote the full strength of their respective associations.

12. *Limitation of Speakers.*—No delegate shall be allowed to speak more than once on any question before the executive (except the mover of a resolution, who shall have the right of reply) unless by special permission of the chairman.

13. *Meetings of Executive.*—Special meetings of the executive shall be convened by the secretary of the Federation at the request or with the assent, in writing, of not less than three members of the executive or associations identified with the Federation. Fourteen clear days' notice being given to all associations of the intention to hold such meeting.

14. *Notice of Resolutions, etc.*—Any association desiring to bring before the executive any question, move a resolution, or give notice of motion to alter, amend, or rescind any rule, shall give to the general secretary notice of such intention at least fourteen days previous to such meeting.

15. *Power of Executive: Appropriation of Funds: Engagement of Solicitor.*—That the executive shall have power to use the funds of the Federation in such manner as they may deem proper and necessary for the purpose of affording protection and assistance to its members according to the objects of the Federation; and shall have power to enter into such engagements as they may deem necessary and proper with a solicitor to manage any legal business connected with the Federation, and particularly to conduct any defences which they may determine upon; but such solicitor shall not transact any business on behalf of the Federation exceeding twenty pounds in costs, except by the authority of a resolution of the executive, unless a case of great emergency should arise which does not afford time for the meeting of the executive, then the authority of the president, vice-presidents, treasurer, and one member of the executive shall be deemed a sufficient authority until a meeting of the executive can be held for that purpose.

In the event of a serious expenditure, a general meeting shall be called. Absent members of executive to have power to vote by proxy.

16. *Order at Meetings.*—The chairman shall keep order at all meetings over which he shall preside, and shall put every proposition which has been moved and seconded to the vote, and the decision of the majority of the members present and the proxies shall in all cases be deemed to be the decision of the whole meeting, the chairman having a casting vote in case of an equality of votes being given; he shall cause to be entered, in the proper minute-book kept for that purpose, all proceedings which it shall be desirable to record, and shall sign the same, and he shall inspect all accounts paid by the Federation.

17. *Duties of Secretary.*—The secretary shall attend all meetings of the executive, take minutes of the proceedings, submit an annual report, conduct the correspondence, and manage the business of the Federation under the control and subject to the instructions of the executive.

He shall send to the various associations identified with the Federation, fourteen days previous to such meeting, notice as to the time and place of holding the annual, half-yearly, and special meetings of the executive, together with a sufficient number of copies of an agenda paper, setting forth in detail the business to be transacted at such meeting, also full copies of any resolution of which he may have received due notice from any association.

No business shall be transacted other than that stated on the agenda paper, except by two-thirds of the delegates attending such meeting.

All resolutions passed at executive meeting shall be read over by the secretary, and signed by the chairman previous to the closing of the meeting. A full copy of the minutes of such meetings shall be printed, and copies forwarded to each association within fourteen days after such meeting.

18. *Arrears of Contributions.*—Any association being six months in arrear with contributions shall not be allowed to vote until the same be paid. That the financial year of the Federation shall terminate as at the end of December, and that contributions from affiliated associations are payable within three months from 1st January.

19. *Duties of Treasurer.*—That all moneys received on account of the Federation must be paid to the treasurer, who shall place the same in the bank in the name of the Federation. He shall pay all accounts and charges for business done or expenses incurred by order of a majority of the executive on behalf of the Federation, and shall prepare annually a financial statement and produce the banking book at every meeting of the executive if required. That the accounts and financial statement shall be certified to by a duly qualified auditor.

20. *Associations requiring Protection of the Federation.*—That each association claiming the protection or assistance of the Federation shall signify the same and set forth the case in writing to the secretary, who shall summon the members of the executive forthwith, at which the representatives of the association aggrieved shall attend, and if a majority of the executive think it is a case for their interference, they shall have power to take such action in the matter, as they may determine, subject to rule 15.

21. *Change of Address of Associations: Secretaries.*—That the address and notice of any change of secretary or address of any association being members of the Federation be immediately forwarded to the secretary of the Federation.

22. *Filling up Vacancies in the Executive, etc., etc.*—That the executive shall have the power to fill up all vacancies arising from death or any other cause, amongst the executive of the Federation. That in all cases which may arise, not provided for by these rules, or any dispute amongst the members or officers respecting the construction thereof, the same shall be left to the executive, whose decision shall be binding till the next special general meeting of the Federation.

23. *Alteration of Rules.*—That any alteration, repeal, or addition to the existing rules of the Federation shall be considered at the annual meeting of each affiliated association respectively. Notice of such appeal, addition, or alteration, shall be specified in writing, and forwarded to the secretary two months prior to the annual general meeting of the Federation; the secretary to lay the same before the executive at their next meeting, provided always that such meeting takes place previous to the said annual meeting, but in case there should be no meeting of the executive, then the secretary shall call a special meeting previous to the annual meeting, to consider the propriety of recommending the adoption or rejection of any alteration, repeal, or addition which may be brought forward for consideration at the annual meeting.

24. *Dissolution of the Federation.*—The Federation shall not be dissolved except by votes of three-fourths of its executive, and in which case the funds shall be divided *pro rata* amongst all associations constituting the National Federation of Butchers' and Meat Traders' Associations.

The objects of the society are set forth in a paper contributed to the annual report of the Federation issued 1898.

The Objects of the Federation.—What on earth do the butchers want? is the vexed question that has bothered the English government departments for a long time.

What is the matter with these butchers? Why are they so unsettled? Does the English government rob and oppress them? or are the existing conditions the outcome of bad laws or the necessity of pressing legislation?

The advancement of science has impressed the public with an idea that they live in an age of alarming conditions. Consequently, local authorities have acted in such a tyrannical manner as to unduly harass and inflict penalties on our traders which are strongly resented, and which they have resolved not to bear quietly any longer. Existing laws are nugatory.

On the questions of "tuberculosis," "compensation for confiscation,' "retention of private slaughter-houses," and "uniformity of meat inspection," our colours are nailed to the mast.

Resources—Associations have always been one of the resources of mankind in every state of life, and in every degree of civilization. It seems as if human nature, conscious of its own weakness and insufficiency, that in itself it was incapable of securing its own happiness, or even its own existence, sought to effect that which was beyond the reach of the individual, by the consent and combination of the many. In this way, a sense of self-preservation dictated the necessity of social unions at the first commencement of man upon earth, in order to secure general safety by general combination. The sense of want, the desire to make labour more productive, and to obtain the largest possible returns for the exertions that were made, taught men in subsequent periods the necessity of co-operation, and led them to unite their efforts, in order that they might be more effective

In the simple state of living, man only craved for food and covering for the body; but with the mind awakened a sense of wants became known which had not been heard of before, until the civilized man was found more dependent on others than the rude settler of old. The same consciousness of insufficiency which prompted associations in the commencement of civilization, suggests the same resources when civilization seems accomplished. Hence the desire for progress, and the keen want and help of society so necessary and so enjoyable to civilized man.

The Meat Traders' Federation.—Temporary societies had existed for specific purposes, dealing with matters as they arose from time to time; but it was eventually sought to permanently establish a Federation of all existing butcher associations, and others to be formed and organised. What for? For every good purpose in connection with the general welfare of the trade.

The main value is in its constituting itself, practically, a trade parliament, where local conditions of the trade can be fully discussed; for, as a rule, it will be found that what affects a certain number in one locality, will operate in the same way towards a similar body in another locality not widely distant.

It behoves all to go on collecting and collating, to the end that the trade may be put upon the best operative basis possible. The Federation is thus founded on sounder principles than any of its predecessors, and it is to be hoped that its operation may justify the good opinion which has hitherto been held respecting it.

Whatever form of meeting our Federation may agree upon, in addition to that specified in the rules, it should be well known, well understood, thoroughly representative, and thoroughly practical, as subjects of difficulty will, in the nature of things, be continually arising.

To fully realise the responsibility of this undertaking, and the influence it is calculated to wield, we have entered on a career of much prospective usefulness in the accomplishment of desirable objects in view.

Our Federation has been fairly launched on its trial, and in proportion as its legitimate ends are pursued and attained, it may expect to gain an impetus to the establishment of

other organisations in the country of like scope and aim to join our ranks, and thus be conducive to the permanent well-being of the trade, exercised everywhere under the best attainable conditions.

Our Federation will at all times gladly aid such organisations in putting their views before the public, and there is no doubt our existance as a Federation will cure many evils that now exist, and strengthen the trade against burdens and impositions which are unjust and harassing.

Sinews of War.—It has long been contended that the time is approaching when a reform in the present system of admission of members to our trade associations must be considered. Ostensibly, every person who is a member is equally qualified to share in any benefits, yet those who do not join our ranks, even in our own city, every year obtain many benefits gratuitously. Although the subscriptions are very reasonable and within the reach of the smallest of traders, yet many are unwilling to contribute any share to the cost of maintenance of the association that works strenuously to obtain so much for the common good of the trade. This ought not to be, for it is morally wrong, degrading and dishonouring. Are not all the reforms achieved in the past, through the instrumentality of these associations, beneficial to members and non-members? In what respect has there ever been the slightest discrimination between those who subscribe to our funds and those who do not, as to their full and free enjoyment of the use of these enormous privileges? None.

The orders of the board of agriculture, in extension of the time wherein animals bought in local markets could be slaughtered, conferred a great boon on our traders. The system of meat inspection, putting an end to the harassing of respectable butchers by the institution of a butchers' jury and appointment of practical men as meat inspectors. The extermination of the practice of persecution by medical officers of health and those in their employment. The care of watching improvement acts, so that obnoxious clauses introduced have been expunged. The careful transit and prompt delivery of cattle. The licensing of drovers, and hosts of subjects pertaining to the welfare of those engaged in our business. Are not all these at the service of non-members as well as members? Of course they are. Then comes the conclusive query.

Are butchers' associations to provide all these enormously valuable considerations, year by year, at their own cost, for the charitable bestowal on non-members without cost? Surely no one with any spirit of fairness, equity, or common enterprise, will desire to see such an inequitable arrangement perpetrated for an hour longer than is necessary to remedy its continuance.

There are many other similar considerations of the same character that might be offered for reflection, considerations that are unanswerable in any way other than a favourable one.

Anyhow, it seems the remedy is in the hands of our traders, and it is to the material advantage of all concerned, both as to the present and the future, to recognise the fact in an accommodating spirit. It also especially behoves the members, through its committee, to see that their money be not squandered at the instigation of any party in faction or personally selfish fighting against a just and fair apportionment, except that of equally sharing fairly the cost of the benefits enjoyed by those who receive them.

Navy Pork.—Navy pork forms a very large article of produce in Cork, in which city its manufacture is specially located in the United Kingdom. The Admiralty annually ask tenders for a certain quantity of pork which has to be prepared from a defined class of animals and packed in a uniform package.

Whole pigs must be used, as it is one of the Admiralty conditions that each cask must contain a proportion of the different parts of the pig—hams, backs, bellies, and coarse meat (that is, necks, legs, and fore legs). The usual weight of the pigs is from 1 cwt. 3 qrs. to 4 cwts.

Pork is made from hog pigs, and mother sows or boars are not allowed to be used. Also, it is stipulated that the meat must not be too fat.

Pigs for navy pork must be chilled in the usual way, then cut as follows:—the back is cut down, the bones being sawn through, the two sides are then cut again from the fore end to the ham in equal parts, this makes four long strips of the carcase. The back pieces are then chopped with a chopper into pieces weighing as nearly as possible 4 lbs. each (this is termed "messing"). The belly pieces are salted whole, and are cut into 4 lb. pieces after being taken out of pickle.

After pork is "messed," it is rubbed with salt and put down into large square tanks, holding possibly 5 tons each of meat or any convenient size. It is packed firmly together in these tanks, and then sprinkled lightly over with saltpetre. It is then sprinkled heavily with salt. The whole is allowed to lie for twenty days, after which it is "drawn" or taken out, and the largest pieces are cut into 4 lb. sizes. This cutting must be accurately done as any serious discrepancy in weights will render the whole consignment liable to rejection by the Admiralty officials.

The pieces are weighed in lots of 200 lbs. each, care being taken to have the various sections of meat equally proportioned.

The packages are then made up in weights of 100 lbs., 200 lbs., or 300 lbs barrels, according to the requirements of the contract. St Jubes salt is added to the casks, being sprinkled over the meat as it is packed, and after these are headed up they are filled with pickle by the bung-hole.

The casks have all to be of standard sizes specified by the Admiralty.

The following is the form of tender for Navy Pork:—

SALT PORK.

TO THE DIRECTORS OF NAVY CONTRACTS,
ADMIRALTY, LONDON, S.W. V. 19.

1

We,
of
in the of , hereby offer, in consideration of payment being made to us at the rates quoted in the following Schedule, to supply and deliver at The Royal Victoria Yard, Deptford, all or any of the quantities of salt pork against which we have inserted prices, subject to the conditions stated on the following pages.

One-third of the casks of each description to be delivered by the* , one-third by the* , and the contract to be completed by the 20th March next.

(*See Notice below*).

Signature,

Witness,

Postal Address,

**To be filled up by firm tendering.*

Notice to Persons Tendering.

1. Tenders need not be for the whole of the quantities required, but no tender will be entertained for a less quantity than 100 casks of either description. Early delivery is desired.

2. Tenders for Salt Pork of the cure of the United States of America will not be considered.

3. Net prices should be given; all trade discounts being allowed in the quotations.

4. Tenders will be received until noon on day of 1 . They should be addressed to "The Director of Navy Contracts, Admiralty, London, S.W.," and marked in the left-hand corner "tender for salt pork."

5. Their lordships do not bind themselves to accept the lowest or any tender, and they reserve to themselves the power of accepting any part of a tender.

Attention is particularly directed to the absolute necessity for delivery by the dates named.

*Conditions of Contract.**

1. *Quality.*—The pork is to be well-fed, prime, good, sound, sweet, fat, entirely free from measles and rust, properly cut without pockets from the carcases of hogs only, weighing not less than 168 lbs. each, and well messed in pieces averaging, when weighed after six hours' drainage, at least 4 lbs. each as regularly as the bones will admit of, one with another, and freshly cured and packed. The whole of each hog cured, including the hams, is to be put in the casks, with the exception of the head, cheeks, feet, skirt, and offal. In curing the pork a full and sufficient quantity of saltpetre is to be used. The examining officers shall be at liberty to apply to the pork the test of boiling, or any other test they may consider necessary.

2. *Packages and Cure.*—The pork is to be delivered in casks of 300 lbs., 200 lbs., or 100 lbs. each, as agreed. Each 300 lb. cask is to contain seventy-five pieces of pork, weighing at least 300 lbs., each 200 lb. cask fifty pieces weighing at least 200 lbs., and each 100 lb. cask twenty-five pieces weighing at least 100 lbs., the weight of the meat being ascertained after six hours drainage. The casks are to have at each head and between the several layers of meat a layer of clean genuine bay salt, of good quality, consisting of well-formed colourless crystals, and to be full of pickle. Each 300 lb. cask is to contain on delivery not less than 60 lbs. of salt; each 200 lb. cask not less than 45 lbs.; and each 100 lb. cask not less than 30 lbs. Each cask is to have branded upon the head the name of the curers, together with the place of cure and the number of pieces it contains.

3. *Casks.*—The casks are to be strong, stout, substantial, and of sufficient capacity, made from Baltic staves free from sap and worm holes, or from staves of equal goodness. Each cask is to be found with eight good and substantial iron hoops placed as follows, viz., two on each chine, one on each bilge, and one on each quarter. The heads of the 300 lb. casks are to be not less than $\frac{7}{8}$ of an inch thick, and the staves not less than $\frac{3}{4}$ of an inch thick in any part; the heads of the 200 lb. casks are to be not less than $\frac{3}{4}$ of an inch thick, and the staves not less than $\frac{5}{8}$ of an inch thick in any part; the heads of the 100 lb. casks are to be not less than $\frac{3}{4}$ of an inch thick, and the staves not less than $\frac{5}{8}$ of an inch thick in any part. The iron hoops on the 300 lb. casks are to be $1\frac{1}{4}$ inches wide, and of No. 13 wire gauge, those on the 200 lb. casks $1\frac{1}{4}$ inches wide, and of No. 14 wire gauge, and those on the 100 lb. casks $1\frac{1}{8}$ inches wide, and of No. 15 wire gauge. Galvanised iron hoops may be used provided they are of the gauges herein specified *before* galvanising, and that they stand the ordinary driving to which they will be subjected.

4. *Delivery.*—(*a*) *By Van or Cart.*—Pork delivered by van or cart is to be deposited at the door of any storehouse, or on any quay, or alongside any ship in the yard, as may be required by the officers. Assistance in unloading will be given by yard labour.

(*b*) *By Rail into the Yard.*—Pork delivered by rail into the yard will be unloaded by yard labour.

(*c*) *By Ship or Barge.*—Pork delivered by ship or barge is to be slung by the ship or barge if a yard crane be available, and will be hoisted out by yard labour. No charge will be made for the yard cranes in performing these services, but all risks of damage to craft or goods during process of discharge are to be borne by contractors, other than damage due to defective dockyard cranes, chains, or other machinery.

If no crane be available the pork is to be delivered by the ship or barge on the quay.

5. *Rejection and Removal of Rejected Pork.*—Should any portion of any delivery under the contract be found, on inspection by the examining officers, not in accordance with the conditions of the contract as regards quality, brand, casks, or cure, the officers are to be at liberty to reject the whole delivery. All pork rejected is to be removed by and at the expense of the contractors immediately after notice shall have been given to them of the rejection. If not taken away within fourteen days, the pork will be returned through the same channel by which it was delivered, and all expenses incurred thereby will be charged against the contractors.

6. *Warranty.*—The contractors guarantee that all pork to be delivered under the contract shall keep perfectly sound and fit for use for two years from the date of delivery into store. Any cask found on survey, held within that period, to contain pork inferior in quality to that stipulated for, or to contain any pieces which are specially excluded under clause 1, may be condemned and sold if practicable, or destroyed if necessary. The amount paid for pork thus condemned, with five per cent. added, together with the amount of freight paid on the same, less the nett amount realised if sold, shall be a debt due to His Majesty from the contractors and recoverable as such.

7. *Arbitration.*—In the event of a rejection of pork by the officers whereby the contractors may consider themselves aggrieved, a re-survey of the pork by two independent persons—to be agreed upon by the parties to the contract—or their umpire, will be allowed, if, before the pork has been removed, the contractors shall, in writing, apply to the financial secretary of the Admiralty for a re-survey, and shall sign the submission to arbitration required by the Admiralty in such cases (a copy of which will, if desired, be furnished to the contractors before tendering), and pending such arbitration, the pork is not to be removed.

8. *Transfer of Contract.*—This contract, or any part, share, or interest in it, is not to be transferred or assigned by the contractors to any person or persons whomsoever, without the written consent of the Admiralty.

9. *Wages.*—The wages paid in the execution of this contract shall be those generally accepted as current in each trade for competent workmen in the district where the work is carried out.

* NOTE.—For the purposes of this contract the word "hog" is to mean a male barrow pig, and a female pig that has not been used for breeding purposes.

10. *Power to Terminate.*—The Lords Commissioners of the Admiralty may at any time terminate the contract if the contractors shall be adjudged bankrupt, or if under any present or future Bankruptcy Act any receiving order or order for the administration of their estate shall be made against them, or if they shall enter into, make, or execute any deed of arrangement as defined by the Deeds of Arrangement Act, 1887, or other composition or arrangement with, or assignment for the benefit of, their creditors, or purport to do so; or if (in Scotland) they become insolvent or notour bankrupt, or application be made under any present or future Bankruptcy Act for sequestration of their estate, or application be made by them or any of their creditors for *cessio bonorum* against them, or a trust deed be granted by them for behoof of creditors.

11. *Payment for Supplies.*—With every delivery of pork under this agreement, invoices,* in duplicate, are to be sent to the consignee by the contractors. The duplicate will be returned by the consignee, with the quantities received noted thereon. The contractors are then to send their claim* for payment to the Accountant-General of the Navy, Admiralty, Spring Gardens, London, S.W. After the necessary examination in office of the claim thus sent, an order for payment of the amount due will be forwarded by him to the contractors.

Schedule.

Number offered.	Place of Cure.	Brand of Meat.	Name of Person by whom cured.	Net Price including delivery. £ s. d.
Casks of 300 lbs. each.				Per Cask of 300 lbs.
Casks of 200 lbs. each.				Per Cask of 200 lbs.
Casks of 100 lbs. each.				Per Cask of 100 lbs.

Note.—see clause 1 of "notice to persons tendering."

* Forms may be obtained on application to the Accountant-General of the Navy, Admiralty, Spring Gardens, S.W.

Instructions for Contractors. — Consignment. — The names of the contractors on the packages, and the posting of invoices immediately after the pork has been forwarded, will much facilitate receipt.

12. *Members of Parliament.* — In pursuance of Act 22 George III., cap. XLV., no Member of the House of Commons is to be admitted to any share or part in the contract, or to any benefit to arise therefrom.

Neats Foot Oil is made from hoofs of oxen, sheep, and if available, goats. True neats foot oil should be the product of the hoofs of oxen only; first immerse in cold water to wash away blood, then scald at 75° C. and remove hair, now immerse in enough boiling water to cover for fifteen minutes, when the claws can be removed, and the feet split, they are now subjected to a prolonged cooking and the liquid allowed to clarify, the fat rising to the surface is skimmed off and cleared by filtering—the product being a pale yellow oil, a good lubricant for delicate machinery.

New South Wales.—*Agriculture.*—In no branch of industry has the progress of New South Wales been more conspicuous than in agriculture. The breadth of land devoted to the plough was, in 1860, not much more than 246,000 acres. At the present time it can hardly be less than 2,439,000 acres; or, including lands sown with European and American grasses, 261,000 acres in 1860, and 2,814,000 acres in 1900. The progress for each decennial period was as follows:—

Year.	Area under cultivation (including sown grasses).
1860	260,798 acres.
1870	426,976 ,,
1880	710,337 ,,
1890	1,241,419 ,,
1900	2,813,961 ,,

Wheat, of course, is the main crop. In 1860 there were 129,000 acres devoted to this cereal. As late as 1880, the area under cultivation was only 253,000 acres, which in 1900 had expanded to 1,425,000 acres.

Live Stock.—The pastoral progress of the colony has been much less satisfactory than the agricultural. The latest returns in regard to sheep show a total of 36,314,000; these figures are for December 1899, and it is hoped that the numbers will not be any further reduced, as with one exception they are lower than those of any year since 1880. The maximum number of sheep in the colony was 61,831,000 in 1891, every year since showing a large reduction. The number of horses at the present time is 480,700—a much smaller total than in any of the previous nine years. The number of cattle is 1,883,000, which is considerably below the average of the past ten years, but so great has been the attention paid to dairying that the value of production from cattle is yearly increasing. The number of dairy cows in the colony is now 416,000, and the weight of butter produced 31,483,600 lb., and of cheese 3,245,300 lb. In spite of the reduced number of sheep, wool maintained its high position among the exports of the colony. Included in the total value of domestic produce exported in 1899 is wool valued at £10,020,495.

In the colony there are 67,790 persons engaged in agriculture, and 26,480 in dairying, while the pastoral industry accounts for 27,890, out of a total population of 1,356,650.

New Zealand.—Frozen meat now takes the second place among the exports of New Zealand produce. In 1899, 1,865,827 cwts. were shipped valued at £2,088,856. To this has to be added £12,973 for frozen fish, £90,910 for

preserved meats, £7,831 of salted beef and pork, £14,364 of bacon and hams, butter £571,799, cheese £141,818, and wool £4,324,627 These amounts with other sundry items for hides, live stock, rabbit skins, sausage skins, sheep skins and pelts, tallow, etc., show a grand total of £8,009,736 under the heading of "Animals and Produce." Notwithstanding a decrease in the wool exports of £321,177 against 1898. The total value of exports under the "Animals and Produce" heading shows an increase of £315,656, as compared with 1898.

Pigs.—The number of pigs in the colony have decreased since 1891, when the number was 308,812 against 249,751 in 1899-1900. The figures given in the following table are those compiled by the agricultural department, and show an increase of 56,239 in 1899 as compared with 1898. It will be noticed that Auckland takes the lead in numbers.

Number of Pigs in each Provincial District.

Provincial District.	Boars for Stud Purposes.	Barrows and Sows over One Year Old for Fattening	Sows kept solely for Breeding Purposes.	Barrows and Sows under One Year Old.	Totals.
Auckland - -	2,081	12,480	9,990	44,864	69,415
Taranaki - -	765	3,151	4,991	28,430	37,337
Hawke's Bay - -	268	1,456	1,779	6,603	10,106
Wellington - -	1,205	4,234	7,577	33,930	46,946
Marlborough - -	112	377	660	2,810	3,959
Nelson - - -	222	837	1,480	7,850	10,389
Westland - -	62	325	265	1,227	1,879
Canterbury - -	719	2,011	5,444	30,193	38,367
Otago - - -	707	3,422	4,605	22,619	31,353
Totals, 1899-1900	6,141	28,293	36,791	178,526	249,751
,, 1898-1899	4,476	25,759	26,203	137,074	193,512
Increase - -	1,665	2,534	10,588	41,452	56,239

The approximate number of the different breeds were:—

	1899-1900.	1898-1899.
Pure Berkshire -	36,942	27,695
Pure Yorkshire -	4,643	3,696
Other Pure Breeds	850	711
Crosses - -	207,316	161,410
	249,751	193,512

Sheep.—In 1899 the flocks of the North Island amounted to 9,953,399 sheep, and of the Middle Island 9,395,107 or a total of 19,348,506, showing a decrease as compared with 1898 of 325,219. The export and local consumption of wool developed from 111,537,546 lbs. for 1891 to 147,902,708 lbs. for 1899.

Over a series of years the number of sheep has been well maintained, although the slaughter needed for the export of frozen mutton increased to upwards of 3,003,000 sheep and lambs in 1899.

The average size of the flocks in New Zealand is found to be 1,040 sheep. It has been estimated that the annual consumption of mutton in New Zealand is equivalent to 2·25 sheep per inhabitant, and that the number of sheep required in one year for local consumption is 1,800,000.

Cattle.—The number of cattle in each provincial district are given in the following table. It will be noticed that 1899 shows an increase of 7,415 head of all clases over 1898.—see foot of page.

Classified according to breed, the numbers for the two years under review are:—

Pure-bred—	1899-1900.	1898-1899.
Shorthorn - - -	50,417	44,742
Hereford - - -	4,301	6,602
Polled Angus - -	8,205	9,434
Ayrshire - - -	5,395	5,241
Jersey - - -	3,540	3,096
Other pure-breds - -	2,623	2,734
Crosses - - - -	1,135,958	1,131,175
Totals - - -	1,210,439	1,203,024

Out of a total of 1,210,439 cattle in the colony, the North Island is shown to have had 869,715, or 72 per cent., while the Middle Island had 340,724, or 28 per cent. Similarly, the dairy cows and heifers intended for dairying in the North Island numbered 245,681, and in the Middle Island 137,762.

Thus, the North Island, which now leads as regards number of sheep, contains nearly twice as many dairy cows and other cattle as the Middle Island.

Of the total number of cattle (1,210,439) given above, 343,556 were dairy cows. It is found impossible to give a statement of the actual amount of butter and cheese made, even at the factories only. All that can be said is that there were in October 1899, 235 cheese and butter factories and creameries, with 171 skimming stations, reported to the department of agriculture. But very few of these factories made any return to the department of their output for the previous year, and it is therefore impossible to arrive at the total quantity of cheese and butter made. The census returns for 1896 show there were in that year only 170 factories and 105 creameries, the annual output at that time amounting to 11,336,776 lb. of butter and 4323 tons of cheese.

The increased demand for beef in 1899 gave a stimulus to this branch of the colony's industries. The quantity exported being 238,234 cwts. valued at £269,459 as compared with 91,729 cwts. valued at £102,512 in 1898.

Provincial District.	Bulls for Stud Purposes.	Steers over Two Years Old.	Cows and Heifers for Dairy Purposes.	Cows and Heifers for Breeding Purposes.	Cows and Heifers for Fattening	Steers and Heifers under Two Years not otherwise enumerated.	Totals.
Auckland - -	5,033	72,833	80,701	45,557	15,327	116,323	335,774
Taranaki - -	3,344	31,186	77,458	5,785	6,975	77,559	202,307
Hawke's Bay -	1,457	25,084	14,995	25,899	2,930	26,743	97,108
Wellington - -	3,958	40,589	72,527	36,648	9,039	71,765	234,526
Marlborough - -	248	1,558	4,649	1,128	705	4,749	13,037
Nelson - - -	612	5,832	12,680	1,499	2,705	11,249	34,577
Westland - -	226	4,045	4,952	1,509	1,206	4,939	16,877
Canterbury - -	1,579	12,538	40,258	1,830	5,664	27,373	89,242
Otago - - -	3,297	28,894	75,223	13,992	8,490	57,095	186,991
Totals, 1899-1900	19,754	222,559	383,443*	133,847	53,041	397,795	1,210,439
,, 1898-1899	18,678	214,822	371,185*	127,308	61,035	409,996	1,203,024
Increase - -	1,076	7,737	12,258	6,539	-7,994 †	-12,201 †	7,415

* Including heifers over two years old intended for dairying: 39,887 in 1899-1900, and 37,649 in 1898-1899.
† Decrease.

Mutton shipments in 1899 amounted to 2,066,805 carcases valued at £1,103,081, while lamb totalled 1,272,348 carcases valued at £603,722, and in addition to these 53,204 cwts. of legs, etc. of mutton were exported valued at £56,992.

Dairy Produce.

Cheese.—New Zealand cheese occupies a unique position on the British markets. It arrives there at a time of the year when there is no other fresh cheese of its class to compete with. Prices are also higher at this season than during other months of the year. There is in addition the advantage of having a steady market as a result of manufacturing having ceased in the Northern Hemisphere, and the supply for the next few months being well known. The comparatively cool climate we enjoy is one of the most favourable in the world for the manufacture and curing of cheese, making it possible to produce the cool, mild flavour which commands the highest price. New Zealand makers ought to compete successfully with the English and Scotch makers of cheddar cheese, but as yet they do not, for while New Zealand cheese has been selling for 60s. per cwt. prime English cheddars were fetching as high as 80s. It will take the united efforts of both suppliers and makers to reach this high standard of excellence.

At the present time one of the greatest faults in New Zealand cheese is lack of uniformity. Examine a hundred cases of cheese and there is great irregularity in the quality. This is a most serious defect. Considering all the advantages that they have, New Zealand cheese makers are not doing as well as the butter makers are.

The following tables give the figures for butter and cheese during the last two years:—

Table showing Total Exports of Butter and Cheese for Two Years ending 31st March 1900 (compiled from Customs Returns).

Port.	Butter.				Cheese.			
	1899-1900.		1898-1899.		1899-1900.		1898-1899	
	Cwt.	£	Cwt.	£	Cwt.	£	Cwt.	£
Auckland	18,205	78,981	11,267	47,810	2,535	5,281	1,438	2,972
Gisborne	528	2,180	...	...	...	...	19	36
New Plymouth	73,992	315,639	58,034	242,272	22,467	47,181	10,894	21,674
Patea	1,525	6,845	675	2,243	1,471	2,962	...	...
Wellington	39,627	171,529	15,710	68,365	22,601	51,955	10,478	21,269
Nelson	717	2,744	338	1,197	...	...	...	...
Christchurch	7,577	33,012	3,727	15,459	5,658	11,231	4,415	8,350
Dunedin	15,195	64.659	8,608	37,254	22,925	50,363	16,641	33,078
Invercargill	704	1,432	4	14	18,024	37,457	6,502	13,491
Wairau	232	869	150	562	65	123	...	...
Wanganui	1,504	5,569	3,258	15,211	...	...	..	...
	159,806	683,459	101,771	430,387	95,746	206,553	50,387	100,870

Butter.—The colony does better with its butter than its cheese, for already the high standard of New Zealand butter is recognised in the home markets. The output has largely increased during recent years and more especially with creamery butter there has been a marked improvement in the quality. A rigid system of registration is carried out in most creameries, cheese factories and packing houses, and the Government officials are thus able to emphasise the necessity for proper care, cleanliness, and most up-to-date methods for producing a high-class article.

While there has been an extraordinary increase in the output of butter and cheese, the prices obtained, especially for cheese, have been very satisfactory. During the latter part of 1899-1900 the dry weather affected the pastures in some localities, and the supply of milk fell off rather early, but, owing to the comparatively good condition in which the cows came through the winter, the yield of milk has been above the average in quantity.

Nova Scotia.—The Secretary for Agriculture for Halifax, N.S., reports for 1899 regarding the grants made by Government, that although helping to a marked improvement in stock generally within the last decade, the general standard is still much below what it should be with the amount of money that has been expended. The trouble seems to be that sufficient discrimination is not made in the quality of the breeding stock, and hence in many districts there is no type at all, but a hetorogeneous medley of nondescript cattle, whose genealogy it would be difficult to trace. The farmers have been strongly urged to select one of the great beef or dairy breeds, depending on locality, and by bringing in only pure bred sires, produce in a short time the best types of beef and dairy cattle. He goes on to describe the various classes of live stock as follows:—

Live Stock.—In this branch the farmers are beginning to see the need of, and advantage gained, by having more pure bred stock, both for dairying and beef. Some of the advanced farmers are finding out that beef can be grown and fatted at a profit, and some are now fully able to compete with Ontario, and I hope within a few years to see our local market supplied by our own farmers, and some to spare for export. The demand for the beef breeds, shorthorn, Herefords, and Polled Angus, is sufficient evidence that we are making a forward move along this line.

Sheep.—From observation in travelling through the province and a visit to our annual provincial exhibition, I can see a noticeable improvement in sheep, and I am glad to say our farmers in many parts of the province are giving special attention to this most profitable branch of farming.

Swine.—In swine we are fairly well supplied with all the popular pure breeds, but I regret that our farmers have not made such progress in the production of pork as their opportunities would permit. We have a home market yet for large quantities of pork, ham, and bacon, now being supplied by other provinces, and if our farmers would turn their attention to pork raising as an adjunct to dairying they would find a profitable return for their labour and feed.

Dairying.—I consider dairying by far the most profitable work of the farm, if we except fruit-growing in the districts especially adapted for it. Since 1893 we have made at least some progress, sufficient at all events to show that we can make butter and cheese to compete with any of the provinces. But I regret that our farmers are not improving and increasing the number of their cows and feeding and caring for them to produce milk at a profit, and thus keep the creameries better supplied. I find several creameries in the province doing well, but a few are not working up to

the capacity to make butter and cheese at a profit. It costs almost as much to make 500 lbs. of butter in a day as 2500 lbs.; hence we see the importance of the farmers so breeding and feeding that they may produce a paying quantity of milk. I find that last season some butter had been imported into Halifax and some of our large towns from the neighbouring provinces, for the reason that our own creameries are not producing enough. The large demand and high prices during the whole of last season should stimulate our dairy farmers to press on and make full determination to hold our own market.

Altogether there are 21 creameries and cheese factories in Nova Scotia, dealing with 10,249,850 lbs. of milk, and producing during the year 287,998 lbs. of cheese and 298,519 lbs. of butter. It was found that the average quantity of milk required to make 1 lb. of cheese was 9·84 lbs., and 1 lb. of butter 22·37 lbs.

Nutmegs and Mace.—The nutmeg tree is a native of the Moluccas, but is also grown largely in Sumatra, Penang, and the West Indies. The tree attains a height of from 20 to 30 feet, and in appearance is very like our ordinary pear tree. The fruit is pear-shaped, and in colour and size resembles an apricot. As it ripens the fruit opens and displays the nutmeg in its shell, encircled by a net work of mace, so that from the same fruit these two pleasant flavouring agents are derived. Nutmegs are valued principally by their size and shape. Fine qualities should be large, heavy, firm, and round, 80 to the lb. being a popular size. Frauds are often perpetrated in depriving the nutmegs of essential oil by distillation and also in filling up worm holes with mastic, but the best way to secure the genuine article is to buy only from houses of repute. The wild nutmeg is of a longer shape than the cultivated, and the flavour is much ranker. Nutmegs and mace are chiefly employed as condiments, and are of great dietetical value. The volatile oils which they contain are used as remedial agents, and have considerable stimulating properties. These spices taken in small quantities assist digestion, dispel flatulency, strengthen the viscera, and stop dysentery.

NUTRITIVE VALUE OF ANIMAL FOOD (FRENCH) IN 1000 PARTS.

Food.	Matter Soluble in Ether.	Solid Matter.	Water.	Matter Insoluble in Ether.	Nutritive Order.
Beef	25·437	277·0	723·0	249·563	1
Fowl	14·070	263·5	736·5	248·930	2
Pork	59·743	294·5	705·5	242·577	3
Mutton	29·643	265·5	734·5	233·857	4
Veal	28·743	260·0	740·0	226·757	5

OATMEAL.—A meal made from Oats, and at one time a very popular article of food among the peasantry of Scotland. The grain grows best in low temperatures and "Scotch Oatmeal" derives its pre-eminence solely from the fact that Scotland is specially suited for the growth of oats, and Midlothian holds the premier position, as there, the grain seems to reach its highest state of perfection. English grain is always much more deficient in the nutritive qualities, hence the comparative superiority of the meal made from Scotch grain.

Processes in the Manufacture of Oatmeal.—The first process is to thoroughly clean the oats from foreign matter, such as peas, beans, tares, barley, and cockle seeds, this is done by putting the grain through a series of grading and cockling machines, suitable for the purpose. After the grain is thoroughly cleaned, it is put on the kiln; this process (old style), takes fully three hours to thoroughly dry the oats, the grain being twice stirred and twice turned all by hand labour. From the kiln it goes to the shelling stone, where the husks and scree dust are removed from the kernals, the scree dust passing through the meshes of a wire covered cylinder, and the husks blown away by the ordinary fanners, while the groats pass on to the grinding stones or rolls, thence to the sieves or graders to be finished off into the different sizes or cuts to suit the trade.

The fine husks, or as they are called meal sids, were at one time used by the poorer classes in Scotland, in the preparation of a dish known as sowens, and in Wales, as succan, which was prepared by steeping the sids in water for a few days, until they fermented, when the mass was skimmed and boiled. It was then cooled down, and assumed the appearance of a pudding or blanc mange. It is still used to a small extent by country people, and is considered a most nutritious dish for dyspeptics. Oatmeal, from being the food of the poor, has now become the food of the rich, and the best markets are in the fashionable quarters of our large English cities.

It is often used in the form of oatcakes, baked sometimes thin, like Passover cakes, and sometimes thick, but of course the chief way in which it is consumed is in the form of porridge.

Oatmeal is a valuable food, but to be thoroughly nutritious, it must be well cooked, hence the custom in many districts of using only the rough meal or rolled oats. It is only by sufficient length of time in cooking, that the natural sweet, agreeable flavour of porridge can be obtained. When properly cooked it thickens to a much greater extent than wheaten flour.

There is, however, quite a variety of other cuts, which are largely used, the finest ground of these being specially suitable for infants and invalids.

Oberland Liver Sausage.—Take a shoulder of pork and remove the bones and the rind. Boil it well with from two to four lbs. of bacon cut into dice. Then mince the shoulder with half its weight of raw liver and some onions chopped very fine. Add the dice-shaped pieces of bacon, and season with salt, pepper, and grated nutmeg, and mix in a little fat if the paste is too stiff. Stuff into ox skins and boil gently from half to three-quarters of an hour. Then throw into cold water, and keep them in it until quite stiff, when they are ready to hang up.

Offal (in Pigs) consists of gut, lights (lump, heart, and liver), wind pipe, and sometimes tongue. If tongue is taken out the caul is weighed in. The offal sometimes includes head and feet.

Offal makes a difference of 2s. per score. A 140 lb. pig yields sides of 56 lbs. bacon, and there are 28 lbs of offal out of the 140 lbs.

Oleo Fat Cutter.—To those who prefer to hash the tallow for the manufacture of oleo or cut up leaf lard in the old fashioned way, the American machine is one of the best that can be used. The principle on which it works is

a series of circular knives rotating between fixed knives and cutting the fat as it is held against the stationery knives, which are fixed to both the top and bottom of machine. Fat is reduced to a pulp which, to many minds, facilitates the operation of rendering. Many renderers, however, prefer a machine which cuts the fat into cubes, and a description of such a machine will be found under Alexander cutters.

Onion and Liver Sausage.—

14 lbs. liver, cut, washed, and scalded.
10 „ boiled pigs' lights.
8 „ back fat cut into dice.
20 „ lean pork.

First mince the liver, add 5 to 6 lbs. of sliced onions, next the lights, not to be too tender, and cut into pieces like beans. All this should be fried lightly on a moderate fire, and then minced quite fine. For spices take 1½ lbs. fine salt, 3 oz. white pepper, 1½ oz. finest marjoram, ½ oz. grated nutmeg. Mix together, and work all well together with the fat, which should be cooked slightly in hot water. After working, the mixture should be beautifully white. Put them in ox or pig skins, making them any length required. Cook them in a temperature of 207° to 210° Fahr. for about thirty minutes. After they are ready, put the sausages in cold water, and let cold water run on them constantly till they are perfectly cold. One must be *very* careful with this sausage to have everything perfectly clean.

Ovens.—see Baking Ovens.

Ox Bungs.—see Bungs.

Ox Tongues to Cure.—see Curing Ox Tongues.

PAISLEY Feeding Meal.—Feeding Meal, from being an article of comparatively little importance, has within the last decade sprung into a foremost position as a reliable feed for cattle, hogs, and poultry. An analysis made by Mr R. R. Tatlock, city analyst, Glasgow, shows the following results:—

Starch, gum, and sugar	59·11
Albuminous compounds	19·15
Oil	6·45
Woody fibre	5·45
Ash	·54
Water	10·30
	100·00

and he reports regarding it: "This is an excellent feeding stuff. It contains as much oil as good linseed cake. It is produced entirely from maize, and is free from every substance which is foreign to that grain." Feeding Meal is a bye product in the process of Indian corn starch manufacture. In the early days of the starch industry considerable difficulty was found in dealing with the glutinous part of the grain, and at that time it was usually disposed off in the wet state. In later years, however, many improvements have been effected; not the least being the quick handling of the Feeding Meal from the time that the grain is ground until the finished product is dried, so that in the most modern works the whole process only occupies twelve hours, and the Feeding Meal is turned out sweet and wholesome.

The only part which is extracted from the Indian corn is the starch, and, as will be seen from the above analysis, there is still such a percentage of gum, starch, and sugar left as makes Feeding Meal a most reliable feed. The experience of those who have used it most largely is that no other feeding stuff gives a larger return of milk in the feeding of cows, and the admixture of a proportion of bean meal or linseed cake makes an ideal stuff.

Of late years one of the most important markets for Feeding Meal has been in the north of Ireland, where the pig rearers have discovered its merits as a fattener, and the result is that several thousand tons find their way annually to the North of Ireland for this purpose. It is also very useful for feeding poultry.

Pale Drying Rooms Temperature.—see Temperatures for Bacon Curers.

Pans.—see Boiling Pans.

Pans for Pork Purveyors.—see Pork Purveyors' Cooking Pans.

Pansitose.—A flaky substance made from cereals, and largely used in all kinds of sausages for binding and filling.

A good binder should hold the sausage meat together in a firm, compact, congealed mass, without showing the presence of a binding substance. To obtain this result, the substance employed as a binder must have very great adhesive qualities, and at the same time be of such a nature as to most readily blend perfectly with the mass, and conform as much as possible to the appearance of the meat itself.

It is claimed for the article that the properties are such that it most readily takes up all the oil and natural juices of the meat, and the flavour of the spices, and distributes them thoroughly throughout the mass, perfectly blending all together.

Pansitose does not gum, but coagulates, therefore the meat is not toughened by the action of the blender.

Pansitose retains all the moisture in the mass, and thus prevents the evaporation of the juices and oils.

Pansitose blends the mass into a perfect consistency for stuffing, gives it an appetising appearance when cut for sale, and a crisp brown appearance when cooked.

Actual comparative tests of Pansitose, potato flour, cracker dust, etc., to ascertain the exact amount of water absorbed by each, showed the following result:—

Bread meal	50 per cent.
Potato flour	70 „
Rice flour	70 „
Cracker dust	80 „
Meat currie	95 „
Pansitose	400 „

That the test should be absolutely fair, one-quarter pound of each article was taken direct from fresh stock, and cold water added to each at the same time and in equal quantities, one ounce at a time, giving sufficient opportunity for each ounce to be absorbed before adding more.

The first ounce was immediately taken up by the Pansitose and the addition was scarcely noticeable, while with the other substances it was necessary to aid absorption by mixing.

The per centage of water mentioned was ascertained by continuous additions of water until each substance had apparently absorbed all it would contain, giving the following result:—

Bread meal - - -	25 minutes.
Potato flour - - -	20 „
Rice flour - - -	20 „
Cracker dust - - -	15 „
Meat currie - - -	15 „
Pansitose - - -	10 „

The water was added cold. Pansitose absorbed the water as rapidly as it was added, practically without assistance, while it was necessary to stir the other substances continually to aid absorption.

Pansitose retained all the water absorbed, while the tendency of the other substances was to settle and separate from the water after standing for a short time undisturbed, showing that they are not perfect absorbents.

Directions how to successfully use Pansitose.—Chop the meat fine.—Good sausage can not be made unless the meat is chopped to the proper degree of fineness, because it will not take up the flavour of the spices, will not stuff easily, does not bind well, and looks bad when cut for sale. The meat must be chopped fine if you want to get the best results from Pansitose.

Do not mix it with water before adding to the sausage meat. Mix it thoroughly with the chopped meat and then add water. The amount of water that should be used depends largely on circumstances and the condition of the meat. Some meat is dry and requires the addition of a large quantity of water to give it the proper degree of moisture, while other meat is naturally very juicy and will require a less amount of additional moisture.

Extensive experiments in America proved that the best results in various kinds of sausages were obtained as follows:—Practical tests showed that where sausages were made for immediate sale and consumption, from twenty to thirty per cent. of water could be added, while sausages intended for shipment, or where not intended for early use, were better if only fifteen to twenty per cent. of water was added. For long distance shipping it is not advisable to add over fifteen to eighteen per cent.

For Bologna Sausage.—Chop the meat fine, then for every one hundred pounds of chopped meat add two pounds of dry Pansitose. Mix the Pansitose thoroughly with the chopped mass and then add as much water as desired, or as much as will be absorbed readily.

For Frankfurt Sausage.—Chop the meat fine, then for every one hundred pounds of chopped meat add one and-a-half pounds of dry Pansitose. Mix the Pansitose thoroughly with the chopped mass, and then add as much water as desired, or as much as will absorb readily.

For Pork Sausage.—Chop the meat fine, then for every one hundred pounds of chopped meat add two pounds of dry Pansitose. Mix the Pansitose thoroughly with the chopped mass, and then add as much water as desired, or as much as will absorb readily.

For Blood Sausage and Pudding.—Chop the meat fine, then for every one hundred pounds of chopped meat add four pounds of dry Pansitose. Mix the Pansitose thoroughly with the chopped mass, and then add as much water as desired, or as much as will absorb readily.

For Head Cheese.—Chop the meat fine, then for every one hundred pounds of chopped meat add one pound of dry Pansitose. Mix the Pansitose thoroughly with the chopped mass, and then add as much water as desired, or as much as will absorb readily.

For Liver Sausage.—Chop the meat fine, then for every one hundred pounds of chopped meat add two pounds of dry Pansitose. Water is seldom added to liver sausage, as it makes it too soft, but a small quantity can be added if desired, and the mass appears to need it.

For Hamburger Steak.—Chop the meat fine, then for every one hundred pounds of chopped meat add one pound of dry Pansitose. Mix the Pansitose thoroughly with the chopped mass, then add water to give it desired consistency, about two pints of water to one hundred pounds of meat will be found the correct amount. While it is not customary to use a binder in Hamburger steak, yet the addition of the above proportion of Pansitose will be found to improve the taste of the steak, and hold it in a better mass for cooking as also giving it a crisp, brown appearance when cooked.

Paper.—see Wrapping Papers.

Parisian Jelly.—Take some pork rind, remove the fat, scrape the outside quite clean, and put into a stewpan, and pour enough warm water over to cover the skin. Let it get quite hot, and stir the skin round in the hot water with a wooden spoon until it becomes quite thick-looking. Now pour the thick-looking water off, and pour some more water on to make the skin quite clear, then put in a little more hot water. To 3 pints of water take 1 lb. rind or $1\frac{1}{2}$ lbs. cooked calves' feet. So that the jelly may be stronger and more tasty, let there be a pound of lean meat. $1\frac{1}{4}$ oz. salt, two lemon rinds, eight whole peppercorns, two cloves stuck in an onion, one carrot, half celery stick, one glass fine vinegar. Put these all in the stewpan beside the meat and water, and stew until the skin is perfectly tender. Let the mass cool, and take all pieces of fat away which have gathered on the top. To clear, put the jelly again on the fire, but let it only get lukewarm. Have the whites of three eggs well beaten, add them with their shells to the jelly, and stir gently. When it comes to the boil, draw the saucepan to the side of the fire, put on the lid, and let it gently simmer for half-an-hour. Pour now through a straining cloth and then through filtering paper into a china dish. Do not put it into the mould until it is lukewarm. Before putting the jelly into the mould, it should be coloured, if desired, with vegetable colours in carmine, violet and orange. It should then be allowed to remain in the shape until perfectly cold. Before turning it out, hold the shape *up to the brim* in water (which is pretty warm, but not so hot as not to bear the hand in it) for some seconds. The jelly can then be turned out on a dish of the shape, but the shape should be again gently put over it to keep it from being damaged.

The copper saucepan used for making the jelly should have a strong bottom.

Paris Meat Supply.—See Meat Supply (Paris).

Parisian Pork Sausage.—(*German Recipe*).—For 20 lbs. take one-third beef and two-thirds pork, either fore-leg or hind-leg, 12 oz. fine salt, 1 oz. pure cane sugar, $\frac{1}{2}$ oz. pulverised saltpetre.

Chop the pork up coarsely, and mix in among it two-thirds of the salt, saltpetre, and sugar. Then cut up the meat and put the other third of the salts amongst it. Then let both meats stand by themselves until red. In summer twelve hours in a cool room is sufficient; in winter they should remain two to three days in a room warmed to about 72° Fahr. Then first take the meat (the beef), chop it fine, then add coarsely chopped pork, also 1 oz. ground white pepper, $\frac{1}{3}$ oz. fine ginger, $\frac{1}{3}$ oz. mace, $\frac{1}{3}$ oz. allspice, 2 eschalots (grated and salted).

Now chop all together until the pork shows through the meat in pieces the size of peas. Add a little water; put the meat into calves' bladders or narrow bullocks' runners of some kind, so as to be air-tight. After filling, hang the sausages in summer outside, for six hours; in winter, from twenty-four to thirty-six hours inside at a heat of 68° Fahr. Then hang up in a room kept at a regular heat of 77° Fahr. until they are as red as cherries. As soon as they are smoked, throw them into hot, *not* boiling, water, and let them *simmer* from three quarters of an hour to an hour, according to their thickness. If ox-skins have been used, the sausages must simmer gently for one and a-half hours to one and three-quarter hours. If they boil quickly, the skins will burst, so great care must be taken. This sausage differs from others, in that it does not require a great heat to cook it.

After this sausage is perfectly cooled, possibly there may be some wrinkles. If there are, dip those sausages on which they appear into hard boiling water for *ten seconds*; that will make them smooth. Now rub them up with a soft towel until they are quite dry, then to make them shine, rub them up with Provence oil.

This sausage is universally liked, but great care is required in the preparation of it.

Parsley.—see Culinary Herbs.

Paste Cutters.—see Pork Pie Making.

Paste Rollers.—see Pork Pie Making.

Pea Sausage.—

220 lbs. shelled *Victoria* pease (which are yellow),
30 ,, grated and pounded carrots,
5 ,, grated onions.

Season to taste with white pepper and grated nutmeg. Mix well, put into skins, and boil in an enamelled pot.

Pearl Ashes were originally derived from the ashes left on burning wood, especially twigs and leaves. The ashes were lixiviated with water and the solution evaporated to dryness, the residue so obtained forming the pearl ashes of commerce. Latterly the salt has been made chiefly from kelp (burnt sea weed) or from kainit, a mixture of salts of potash, soda, magnesia and lime, which occurs in large deposits in certain parts of Germany. Pearl ashes consist essentially of carbonate of potash and the compound is strongly alkaline and detergent. In the food trades it is used principally in cleansing and bleaching sausage skins and bladders.

Pennyroyal.—see Culinary Herbs.

Pepper.—Probably no spice is of so much service as pepper. It is certainly the most popular of all spices. The pepper vine is a native of Malabar and Travancore, but is now pretty generally cultivated all over the East. The favourite qualities come chiefly from Singapore, while shipments are also largely derived from Penang, Tellicherry, Sumatra, Trang, Siam, and Cochin. The plant requires to be supported by trees, posts, or other supports. It is propagated by simply planting cuttings or suckers before the commencement of the rains in June, in a rich and tolerably moist soil. The vines bear fruit in three years and continue bearing for ten or twelve years. The crop is gathered in March or April; the spike-shaped clusters being plucked and dried on mats in the sun. White pepper differs from black only in being deprived of the outer skin, and this is accomplished by macerating the berries in water and then gently rubbing the skin off. A good deal is lost in taking off the skin, as the peculiarly agreeable aromatic flavour of ground black pepper is derived largely from the skin.

The pepper vine grows to a height of twenty to thirty feet, but for the sake of convenience in harvesting it is usually kept very low. Used in moderation pepper assists digestion and is most wholesome and stimulating to the stomach. Many natives in India drink a strong infusion of pepper as a stomachic or appetiser, and in some districts a fiery spirit is made from the berries which is used for the same purpose.

Pepper Grinding Mills.—In the large pepper grinding factories, stone mills are used for the purpose as these make by far the best grist, but where users wish to grind their own pepper and so obtain the benefit of the fine aroma which can only be had from freshly ground corns, steel mills with specially hardened grinding plates are commonly used. The steel plates are circular and have the faces grooved to a particular skew so as to make an efficient grinder. These mills may be had in different sizes both for hand and power.

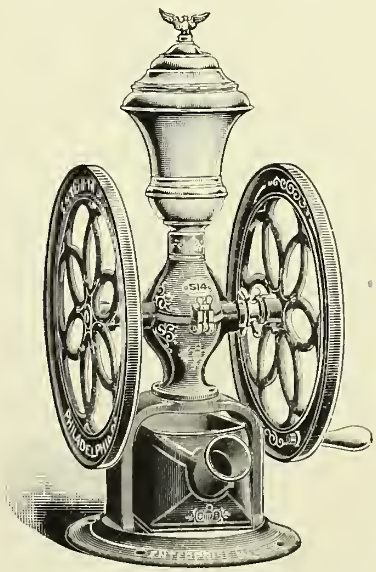


Fig. I. American Hand Power Pepper Mill.

The American hand-power machines are useful where a small quantity of pepper only is required to be ground at one time, but where moderate quantities are required at a time, it is better to have a power driven machine. This may be effected by either adopting a mill with electric motor combined, or connecting the mill to existing power by means of a belt.

In cases where belt driving is adopted the simplest form of mill suitable is Fig. IV.

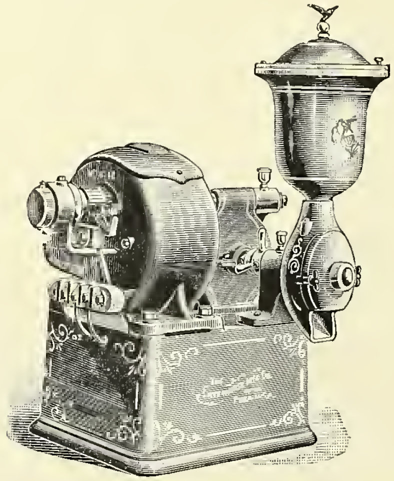


Fig. II. Pepper Mill with Electric Motor Combined.

Fig. III. can be made into a belt driven machine by removing the handle and affixing a pulley to the spindle. Fig. IV. is suitable for belt driving only as it is a much heavier mill in every way. It can, however, be mounted on

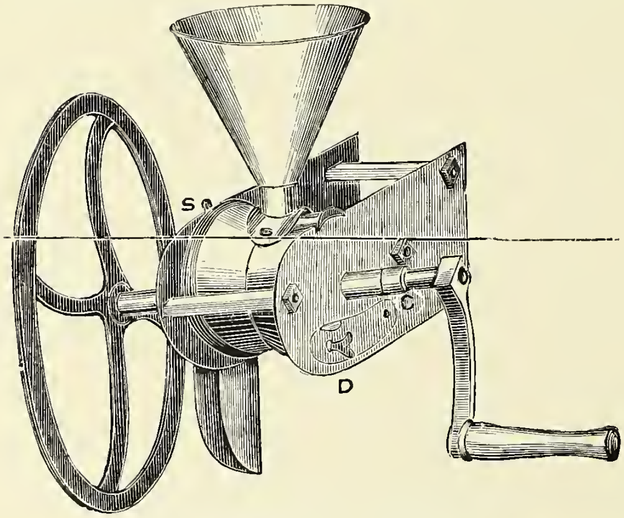


Fig. III. Post Pepper Mill for Hand-power.

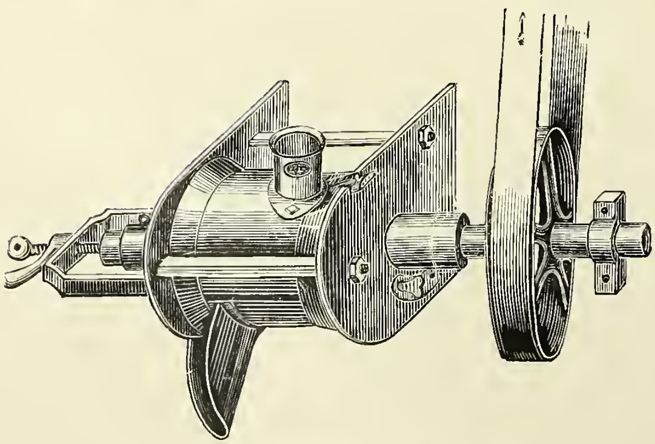


Fig. IV. Post Pepper Mill for Belt Driving.

a post similar to Fig. III., with the addition of a bearing fixed to the wall. Another style is Fig. V. which can be bolted to a table or bench.

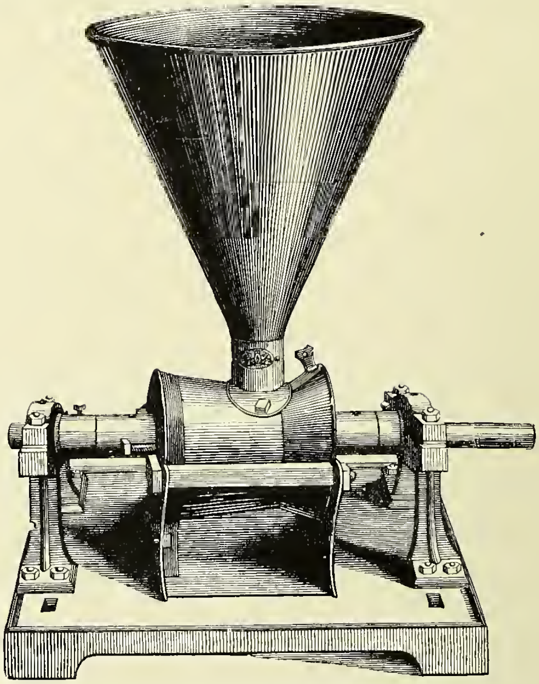


Fig. V. Table Pepper Mill for Power.

Peppermint.—see Culinary Herbs.

Pepsin.—Pepsin is the active principle of the gastric juice—a liquid secreted in the membranes of the stomach, and it is by the action of this substance that food is digested. It is extensively extracted from the stomach of the pig and used as an artificial aid to impaired digestion. It is extracted as follows:—The stomachs are emptied out and sponged clean very gently. Then the pepsin is extracted by pressing a blunt knife along the surface. The expressed pepsin is evaporated at a low temperature and diluted to standard strengths by mixing with some innocuous powder.

Another method is to clean the stomachs as above and steep them in very dilute hydrochloric acid, which assists the gastric juice to dissolve the stomachs entirely, and the solution is evaporated as before at a low temperature, and finally crystallised.

Permanganate of Potash.—A purple coloured salt which is one of the best deodorants for liquids and solids known. It is not of much use for purifying air as it is not volatile. It forms the basis of Condy's fluid. It is made by roasting together, black oxide of manganese, potassium, chlorate, and caustic potash. The residue is dissolved in water and a current of carbonic acid gas passed through it. After settling, the clear purple solution is evaporated until crystals form, when it is allowed to cool and the mother liquor is drained away and the crystals allowed to dry, when they are ready for use. Permanganate of potash besides its extensive use for deodorising sewage, offal, etc., is also very useful for purifying water. A few drops or a trace of the powdered crystals added to the suspected water, until it is slightly pink, will kill all germs and render it safe to drink. It is commonly used by travellers in tropical countries for this purpose.

Pickle—*Aromatic Salt Pickle (German).*—

Take $7\frac{1}{2}$ gallons water,
1 lb. Indian cane sugar,
$\frac{1}{2}$,, pulverised cleaned saltpetre,
3 oz. coriander seeds,
a pinch of dried bay leaves,
three sticks of garlic.

Boil for five minutes, let it cool, put through a sieve, and throw away the refuse. This brine will keep all summer, and can be used for every kind of meat. Of course, every kind of meat must be thoroughly rubbed with fine salt before being put in the pickle. Everything so pickled has a fine red colour and a pleasant taste.

Pickled Sausage.—

Take 40 lbs. hog rinds (on which considerable fat has been left),
10 lbs. beef snouts,
28 ,, calf feet,
30 ,, veal.

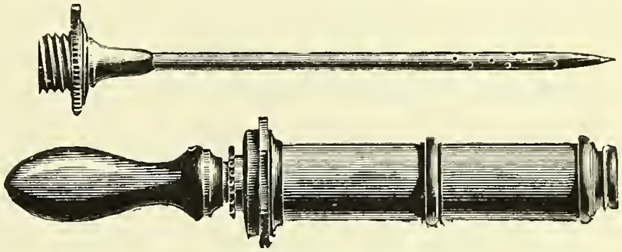
Cook until soft, remove the bones, chop fine, and
Add 16 pints of wine vinegar,
8 oz. salt,
4 ,, ground pepper,
4 ,, caraway seed,
1 ,, cardamon and the peel of
5 lemons ground fine.

After mixing well, boil for 2 min. in an earthen dish, and then pour into an earthen vessel; after 24 hours the whole will be gelatinised and will have assumed the form of the vessel in which it has been poured. They may be cut and sold in slices.

Pickled Skins for Sausages.—See Skins, to Pickle for Sausages.

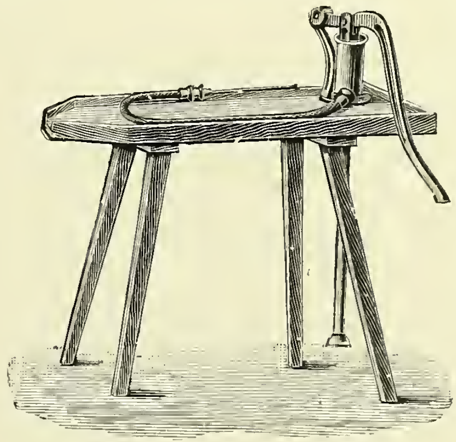
Pickled Pork.—For 80 lbs. of meat, use two quarts and one pint of fine salt, four pounds of sugar or one quart best molasses, three ounces saltpetre, pulverise and mix the seasoning with the exception of the two quarts of salt, using the one pint only. Rub the meat well all over and lay upon boards in the cellar for 24 hours, then put a few clean stones in the bottom of barrel, lay sticks across these that the meat may not soak in the liquor that drains from it. Pack the meat in layers, strewing between these the remaining two quarts of salt. Let it lie in the cask for 15 or 16 days, every day during this time tipping the cask to drain off the liquor, or drawing it through a bung-hole near the bottom. Pour this back in cupfuls over the meat. Take it out at the end of a fortnight, rub each piece well over with dry salt and return it to the barrel. If the liquor does not cover it, make fresh brine in the proportion of 2 lbs. salt, $\frac{1}{4}$ oz. saltpetre, and 1 quart water, and pour in when cool after it has boiled for half-an-hour. Lay a round piece of board upon the upper layer and keep this down with weights. The pork should be put into the brine with the rind upwards. In this position it does not get oversalted. Examine from time to time to be sure the meat is keeping well. Should it seem likely to taint, throw away the pickle, rub each piece over with dry salt and pack anew. Pork pickled in this way will keep two years.

Pickle Pumps (*Brine Pumps, Bacon Pumps, or Salting Pumps*). — There is perhaps no process so important in the curing of meats as pumping. The object of it is easily understood. Meat is liable to very speedy decomposition unless it is immediately brought in contact with a preservative of some kind, such as salt, borax, etc. In ordinary course, if any of these preservatives were laid on the exposed surface of the meat they would mingle with the meat juices, become dissolved, and percolate



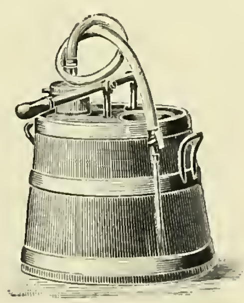
Small Pickle Pump (or Syringe).

slowly through the tissues. But this process is slow and under many conditions of temperature, dangerous. Hence the necessity of an appliance which brings the preservatives



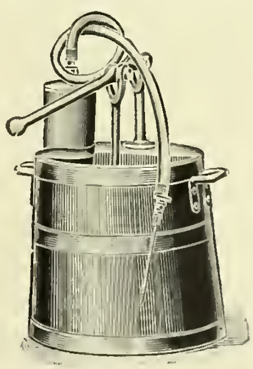
Pickle Pump on Timber Stand.

at once into operation. The salt pickle or brine, made from recognised recipés, is filtered or syphoned so that it runs clear, and is then injected into the meat to be cured.



Pickle Pump with Timber Pickle Tank and Air-Vessel.

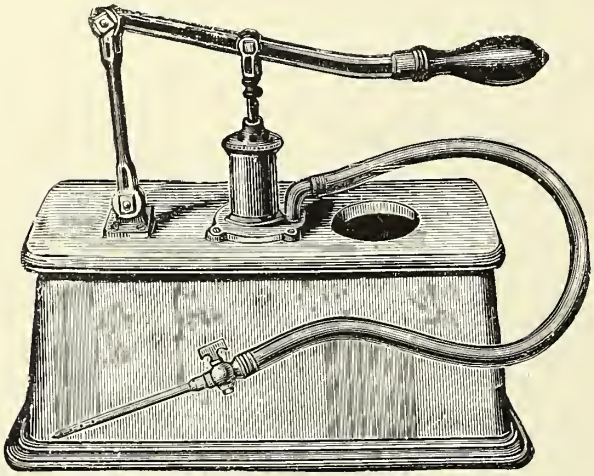
Capacity 4 gallons.



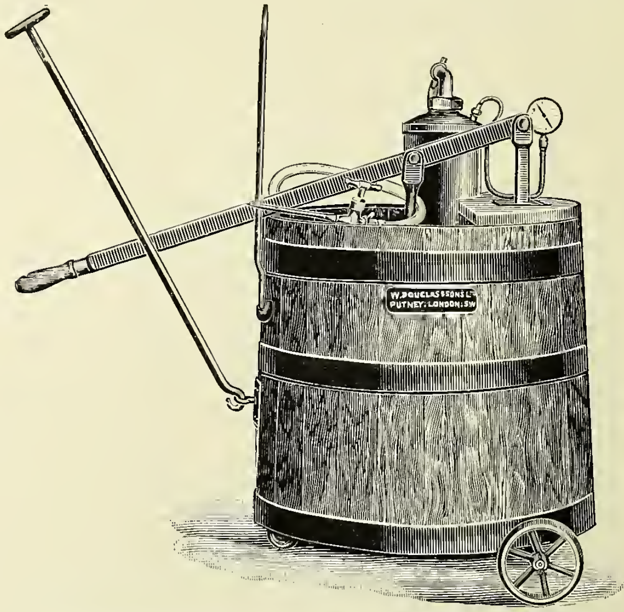
Pickle Pump with Timber Pickle Tank and Air-Vessel.

Capacity 8 gallons.

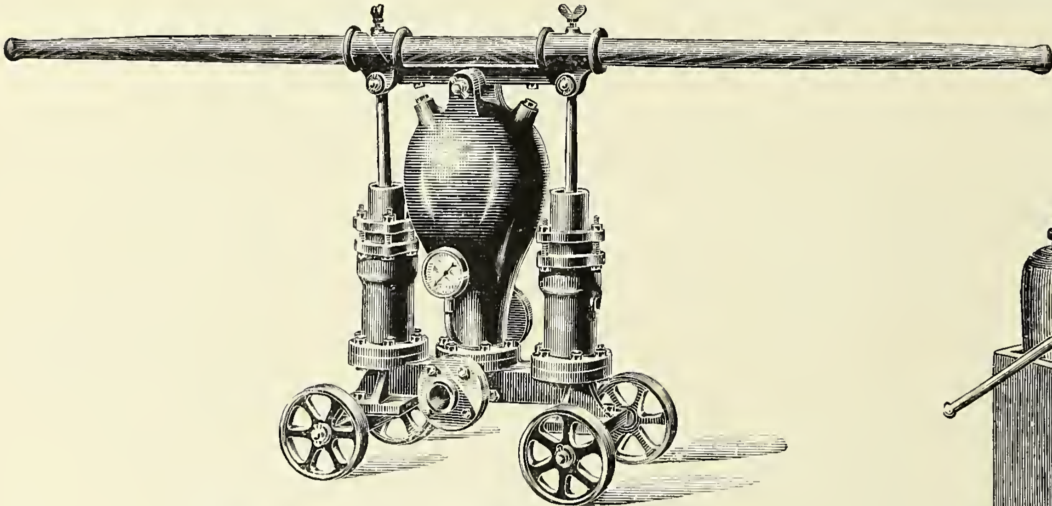
For small curers who cure a few tongues, rounds of beef, pickled pork, and such like, a very small pump is necessary. To those in a larger way there are a number of designs each with certain merits.



Pickle Pump with Cast Iron Enamelled Tank.
Capacity 4 gallons.



Pickle Pump with Circular Timber Pickle Tank, Fitted with Large Copper Air-Vessel and Pressure Gauge.
Capacity 40 gallons.

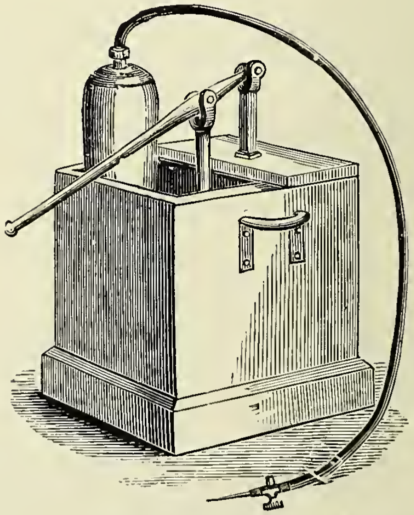


Pickle Pump with two Pumping Cylinders, Lever Handles, and Cast Iron Air-Vessel.

This pump is connected on the one side by a flexible rubber hose to pickle supply, and on the other side is connected with the pickle needles, through which the pickle is distributed into the bacon. The length of suction hose supplied is $9\frac{1}{2}$ feet, and delivery hose 16 feet, both of which are provided with screw couplings; 24 needles are supplied with each machine, along with 3 taps with nipples for delivery pipe and pressure gauge, as illustrated. All the taps and nipples are of tinned metal.

The object of this pump is to procure that equality of pressure in pumping, without which it is impossible to cure bacon properly.

Pickling Beef and Hams.—(American Recipé).—To 100 lbs. of beef or ham, use 7 lbs. rock salt, 5 lbs. brown sugar, 2 ozs. saltpetre, $\frac{1}{2}$ oz. saleratus. Mix together and boil in 4 gallons of water. Skim while boiling and pour on to the meat hot. For hams to cure well, they should remain in the pickle six weeks.



Pickle Pump with Timber Pickle Tank and Air-Vessel.
Capacity 10 gallons.

Pickling Hams.—see Hams.

Pickling Tubs or Vats.— Pickling tubs or vats are used for a great many different purposes. They are necessary to the meat purveyor for curing tongues, rounds of beef, etc., they are equally necessary to the pork purveyor for pickling pork and other products. In the bacon factory they are useful for curing heads, houghs, feet, and the smaller bye-products, and, last of all, they are essential in the manufacture and storing of pumping pickle.

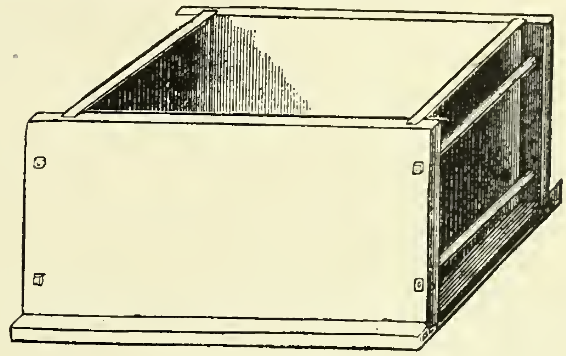
The construction of pickling tubs is very simple. The main thing is to have them made of new oak wood and not to trust to old barrels sawn in two. More meat is lost by that false economy than would pay for many tubs. Oak is the best thing to use, undoubtedly, as it is hard and free from resin. It is also very enduring.

Oak Pickling Tub.
From 20 to 55 gallons capacity.

Oak Pickling Tub.
About 90 gallons capacity.

The shape of the tubs is conical as illustrated, and inside, if they are to be used for pickling, as distinguished from their use for storing pickle, they ought to have a perforated circular cover. This is used for keeping down the meats during the curing process.

There are other pickle vats in use besides these described. Some are made of slate fitted together in slabs so as to form square vats. Others are made of Caithness flagstones fitted together in the same way as the slates. Others again are built of concrete faced with smooth cement, and are fitted into premises in whatever convenient situation can be found. The disadvantage of these, at least to the small manufacturer, is in their want of portability.



Slate Tank Pickling Vat.

Pie Cooling Rack.—see Cooling Rack.

Pie Jiggers or Jaggers.—see Pork Pie Making.

Pie Meat Cutters.—see Pork Pie Making.

Pie Moulding Machines.—see Pork Pie Making.

Pie Ovens.—see Baking Ovens.

Pie Paste Rollers.—see Pork Pie Making.

Pig Abattoirs.—see Abattoirs (Pig).

Pig and Bacon Statistics.—*Actual Weighings.*—The following statistics are valuable as showing the actual turn-out of pigs of various sizes. The weighings were carried out with every care, so as to ensure accuracy.

It may be reckoned that the two sides of a pig will weigh $\frac{4}{5}$ of the actual live weight. If a pig weighs 200 lbs., then two sides fit for curing (Wiltshire style) would weigh 160 lbs. (80 lbs. each). These sides would lose $2\frac{1}{2}$ lbs. each in salting, and if smoked, another $1\frac{1}{2}$ lbs. each, or a total of 8 lbs. in all.

Actual Weighings of Four Pigs of Different Weights.

	No. 1 Pig. Sides marked 1 and 2.	No. 2 Pig. Sides marked 3 and 4.	No. 3 Pig. Sides marked 5 and 6.	No. 4 Pig. Sides marked 7 and 8.
Payable Weights.	11 sc. $19\frac{3}{4}$ lbs. = $239\frac{3}{4}$ lbs.	9 sc. 15 lbs. = 105 lbs.	7 sc. 13 lbs. = 153 lbs.	7 sc. 6 lbs. = 146 lbs.
Bones - - -	$6\frac{1}{4}$ lbs.	$5\frac{3}{4}$ lbs.	$4\frac{3}{4}$ lbs.	4 lbs.
Blade bones - -	$2\frac{1}{4}$,,	$2\frac{1}{4}$,,	$1\frac{3}{4}$,,	$1\frac{3}{4}$,,
Steaks - - -	$2\frac{1}{4}$,,	$2\frac{1}{4}$,,	$1\frac{1}{2}$,,	$1\frac{1}{2}$,,
Cuttings - -	2 ,,	2 ,,	$1\frac{1}{2}$,,	$1\frac{1}{2}$,,
Kidneys - -	$\frac{1}{2}$,,	6 ozs.	$\frac{1}{2}$,,	$\frac{1}{2}$,,
Flick lards - -	$8\frac{3}{4}$,,	7 lbs.	$5\frac{1}{2}$,,	$4\frac{1}{4}$,,
Fat - - -	$2\frac{1}{2}$,,	$2\frac{1}{4}$,,	$1\frac{1}{2}$,,	2 ,,
Feet - - -	$3\frac{3}{4}$,,	4 ,,	3 ,,	$2\frac{1}{2}$,,
Blade bones - -	$\frac{1}{2}$,,	$\frac{1}{2}$,,	$\frac{1}{2}$,,	$\frac{1}{2}$,,
Skulls - - -				
Chaps and tongues -	$7\frac{3}{4}$,,	$14\frac{1}{2}$,,	$9\frac{3}{4}$,,	$8\frac{3}{4}$,,
Tongues - -	$11\frac{1}{4}$,,	$2\frac{1}{2}$,,	$1\frac{1}{2}$,,	1 ,,

Two Sides.	cwt. qr. lb. 1 2 24		cwt. qr. lb. 1 1 12		cwt. qr. lb. 1 0 9		cwt. qr. lb. 1 0 6	
	Sides.		Sides.		Sides.		Sides.	
	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	No. 6.	No. 7.	No. 8.
	qr. lb.	qr. lb.	qr. lb.	qr. lb.	qr. lb.	qr. lb.	qr. lb.	qr. lb.
Same day as killed -	3 11	3 13	2 20	2 20	2 6	2 3	2 4	2 2
Day after killing -	3 10	3 12	2 20	2 20	2 5	2 3	2 4	2 2
Weight of sides when cured (21 days old)	3 8	3 11	2 19	2 19	2 3	2 1	2 3	2 1
Weight of sides washed and drained	3 8	3 10	2 19	2 18	2 3	2 0	2 2	2 1
Weight of sides when smoked (28 days old) - - -	3 3	3 5	2 14	2 13	1 27	1 24	1 26	1 25

Actual Weighings of a Pig 7 score 13 lbs.; that is 153 lbs. payable

Bones -	$4\frac{3}{4}$ lbs.	Two sides—121 lbs.
Backbone -	$1\frac{3}{4}$,,	
Steaks -	$1\frac{1}{2}$,,	
Cuttings -	$1\frac{1}{2}$,,	Day after killing—going into salt, 120 lbs.
Kidneys -	$\frac{1}{2}$,,	
Flick lards -	$5\frac{1}{2}$,,	
Fat - -	$1\frac{1}{2}$,,	Cured (twenty one days old)—115 lbs.
Feet - -	3 ,,	
Blade bones	$\frac{1}{2}$,,	
Head - -	$9\frac{3}{4}$,,	Smoked (twenty-eight days old)—108 lbs.
Tongues -	$1\frac{1}{2}$,,	

Actual Weighings of a Sow 16 score, 8 lbs. payable (328 lbs.)

Flick, kidneys and skirt	16 lbs.	Griskin - -	$6\frac{1}{2}$ lbs.
Head - - -	26 ,,	Four knuckle bones	8 ,,
Backbones - -	$4\frac{1}{2}$,,	Four feet - -	$7\frac{1}{2}$,,
Ribs - - -	$11\frac{1}{2}$,,	Rinds - -	$12\frac{1}{2}$,,
Spare ribs and bones	$2\frac{1}{2}$,,	Fat for melting -	23 ,,

Meat for sausages - - 210 lbs.

Actual Weighings of Two Sides of Bacon Smoked.

	No. 1 Side. Weighed 2 qrs. $16\frac{1}{2}$ lbs.		No. 2 Side. Weighed 2 qrs. 5 lbs.	
	qrs.	lbs.	qrs.	lbs.
$\frac{3}{4}$ side - - - - -	1	$26\frac{1}{2}$	1	$16\frac{1}{2}$
Fore - - - - -		18		$16\frac{1}{2}$
	2	$16\frac{1}{2}$	2	5
Jacket - - - - -	2	$0\frac{1}{2}$	1	$19\frac{1}{2}$
Gammon - - - -		16		$13\frac{1}{2}$
	2	$16\frac{1}{2}$	2	5
Fore - - - - -		18		$16\frac{1}{2}$
Middle - - - - -	1	$10\frac{1}{2}$	1	3
Gammon - - - -		16		$13\frac{1}{2}$
	2	$16\frac{1}{2}$	2	5

Buying Pigs by thickness of Fat.—This system is now adopted in the West of England by the various bacon curing houses there. It has been in operation some two years now, and has come to be recognised by the farmers as fair and equitable. The following shows the method of adjusting the prices :—

	Weight.	Thickness of Fat in any Part of the Back.	Price.
1	6 sc. 10 lbs. to 9 sc. 10 lbs. - -	Not exceeding $2\frac{1}{4}$ inches -	Top price.
2	Under 10 sc. 10 lbs.	Not exceeding $2\frac{1}{2}$ inches -	6d. per sc. less than 1st price.
3	Under 11 sc. 10 lbs.	Not exceeding $2\frac{3}{4}$ inches -	9d. per sc. less than 2nd price.
4	Under 12 sc. - -	Not exceeding 3 inches -	9d. per sc. less than 3rd price.

Pigs exceeding these limits, and soft, or otherwise inferior, will be paid for at their value.

The Actual Output of Bacon from various sizes of Pigs, and the Weights of Bales and various selections.

	Dead. cwts.	qrs.	lbs.
Whole pigs, heads, feet, and offals, weighing - -	1	0	0
Give sides of about 46 to 50 lbs. culled 6 sided bacon.			
Whole pigs, heads, feet, and offals, weighing -	1	1	0
	to 1	1	14
Give sides of about 54 to 58 lbs. culled sizeable, top price.			
Whole pigs, heads, feet, and offals, weighing -	1	0	15
	to 1	2	0
Give sides of about 60 to 64 lbs. culled stout, sizeable.			
Whole pigs, heads, feet, and offals, weighing -	1	2	1
	to 1	3	0
Give sides of about 65 to 75 lbs. culled, heavy.			

These are the general weights bought, but they are again selected up according to degree of fatness, quality, etc. and give the following selections :—

Six sided bacon, 6 sides to a bale; selected fat and lean six sided bacon.

Sizeable bacon 54 to 56 lb. sides selected as follows :—

Nos. 1, 2, 3 sizeable and stout sizeable, 58 to 62 lb. sides selected into fats and mediums, and lean medium; next are heavy lean, heavy and extra heavy; next $\frac{1}{2}$ branded goods, seconds.

Prices vary with the market. Sizeable lean is generally top price, but other selections often come near it if the supply is short.

Estimate showing Working Expenses on 500 Pigs per week.

To purchase—	cwts.	qrs.	lbs.				
500 pigs $4102\frac{1}{2}$ sc. @ 8/6 per sc. =	732	3	$10\frac{3}{4}$	47/7	£1743	11	3
Expenses—							
Carriage - - - -	£70	10	0				
Curing - - - - -	6	10	0				
Coal - - - - -	3	10	0				
Horse - - - - -	1	10	0				
Packages - - - -	8	5	0				
Smoking - - - -	2	0	0				
Commision - - - -	37	7	11				
Stamps and telegrams -	2	10	0				
Stationery - - - -	1	0	0				
Insurance - - - -	1	0	0				
Incidental expenses—trade charges, rates and taxes	10	0	0				
Wages - - - - -	25	0	0				
Salary - - - - -	12	0	0				
Travelling expenses -	3	0	0				
Advertising - - - -	5	0	0		189	2	11
Profit (about 4/5 per pig)					109	14	8
					£2042	8	10

	cwts.	qrs.	lbs.		£	s.	d.
By sales—1000 sides	577	0	21	64/	£1847	0	0
,, shrinkage in smoking	13	1	21	loss.			
,, flake lard	25	1	22	30/	38	3	4
,, lard cuttings	4	3	18	30/	7	7	4
,, heads	50	0	0	18/	45	0	0
,, loins and steaks	10	2	24	44/	23	11	5
,, skirts	4	1	24	32/	7	2	10
,, kidneys, 83⅓ doz.	2	2	20	9d. doz.	3	2	6
,, pockets	2	0	26	46/	5	2	8
,, bits	2	2	20	18/	2	8	2
,, breast bones	5	1	12	12/	3	4	3
,, strips	6	1	0	8/	2	10	0
,, back bones	8	3	20	8/	3	11	5
,, blood bits	1	1	10	8/	0	10	8
,, feet	13	1	16	8/	5	7	1
,, blade bones	3	3	8¾				
or 4102½ scores	732	3	10¾				
By caul fat	5	0	0	30/	7	10	0
,, gut fat	5	0	0	15/	3	15	0
,, 500 henges and plucks				1/	25	0	0
,, 500 bladders, 41⅔ doz.				6d. doz.	1	0	10
,, sausage skins	1	1	26	1/4	11	1	4
					£2042	8	10

A sausage department should show an additional profit.

Pigs' hair dried
Blood dried
Bone manure
Gelatine
} May all be remunerative by a little extra care and manipulation.

The following tables relative to pigs are taken from an account of investigations carried out by Professor M'Murtrie.

Comparative Results of Weighing the constituent parts of a Poland-China and a Berkshire Pig.

CONSTITUENT PARTS.	POLAND-CHINA.		BERKSHIRE.	
	Actual Weight.	Per cent. of Live Weight.	Actual Weight.	Per cent. of Live Weight.
	lbs.		lbs.	
Blood	11·50	3·38	6·00	2·44
Hair	2·25	0·66	1·50	0·61
Entrails and contents	17·25	5·07	15·00	6·11
Lungs, kidneys, spleen, and brains	5·75	1·07	4·75	1·95
Flesh, without fat or bones	101·00	29·70	80·00	32·61
Hearts, livers, and tongues	6·50	1·91	6·00	2·44
Bones, crude	21·50	6·30	17·50	6·73
Side fat	104·50	30·73	70·00	28·57
Kidney fat	12·00	3·57	8·00	3·26
Fat on entrails	5·00	1·47	3·50	1·43
Skin	17·00	5·06	12·00	4·88
Loss	35·75	10·29	20·75	8·87
Total	340·00	99·21	245·00	99·90

Analysis of the constituent part of Pigs.

PARTS.	MOISTURE.	FAT.	ASH.	PROTEINE
Poland gut fat	9·630	88·3900	1·9100	2·9370
,, side fat	5·000	92·3300	0·0015	2·6680
,, kidney or leaf fat	4·118	96·3369	0·0660	1·2500
,, flesh	60·530	13·5050	0·8000	25·1650
,, bone	38·655	21·1706	24·8080	16·3644
,, skin	53·320	3·7420	0·3440	42·9540
Berkshire gut fat	19·350	78·6100	0·0023	2·0400
,, side fat	8·130	90·8460	0·0428	0·9812
,, kidney fat	1·730	95·4250	0·0445	2·8005
,, flesh	67.300	15·5840	0·7790	16·8370
,, bone	40·994	20·8830	27·1360	10·9970
,, skin	49·380	4·6250	0·6400	45·7150

The following are the reductions to per centages of the foregoing table.

POLAND CHINA HOG.

Parts.	Per Cent of Carcase	Water.	Fat.	Ash.	Proteine.
Flesh	39·453	23·985	5·320	0·3156	9·9280
Bones	8·397	3·151	1·778	2·0832	1·4390
Side fat	40·820	2·041	37·689	0·0061	1·0890
Kidney fat	4·690	0·193	4·578	0·0030	0·0058
Skin	6·640	3·540	0·248	0·0228	2·8282
Total	100·000	32·910	49·553	2·4307	15,2900

BERKSHIRE PIG.

Parts.	Per Cent of Carcase	Water.	Fat.	Ash.	Proteine.
Flesh	42.666	28·714	6·639	0·3323	7·183
Bones	9·333	3·882	1·949	2·5226	1·026
Side fat	37·333	3·035	33·915	0·0159	0·367
Kidney fat	4·266	0·074	4·070	0·0018	0·119
Skin	6·400	3·160	0·296	0·0409	3·325
Total	99.998	38·865	46·869	2·9135	12.020

The following are Messrs Gilbert & Lawes analyses of English pigs; Dr. Wolff's analyses of German pigs; and Professor M'Murtrie's analyses of American pigs, compared—

PARTS.	ENGLISH.		GERMAN.		AMERICAN.	
	Store Pig.	Fat Pig.	Well Fed.	Fat.	Poland.	Berkshire.
Water	58·1	43·0	57·9	43·9	32·9	38·8
Fat	24·6	43·9	24·2	42·3	49·5	46·8
Ash	2·8	1·7	2·9	1·9	2·4	2·9
Proteine	14·5	11·4	15·0	11·9	15·3	12·0

The composition of pork and bacon (Davy).

CONSTITUENTS.	FAT PORK.	DRIED BACON.	GREEN BACON.
Proteine	9·8	8·8	7·1
Fat	48·9	73·3	66·8
Ash	2·3	2·9	2·1
Water	39·9	15·0	24·0

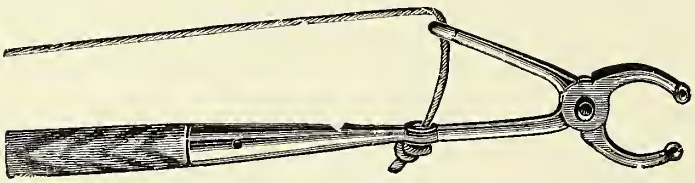
See also Nutritive Value of Animal Food.

Pig Breeding Institutions (Denmark).—see Bacon Curing in Denmark.

Pig Bungs.—see Bungs (Pig).

Pig Casings.—The small intestines of the pig. To be good and serviceable they should be well cleaned, of good fair colour, well salted and of medium width. The medium width are what are known as selected casings and come from medium sized pigs. The best casings are those that have been kept for from four to six months and thus have had an opportunity to become tough and well salted. Medium skins should make up to about 40 lbs. sausages to 1 lb. of casings. Unselected and other casings unsuitable for sausage making are spun into bands and other strings for a variety of purposes (see also Sheep Casings).

Pig Catcher.—An apparatus with tinned iron head as shown in illustration and with long wooden handle and rope. The jaws of the iron head are placed round one of the hind legs of the hog to be caught and the rope being pulled tight the hog is held fast. The handle is usually about 6 feet long and the apparatus can therefore grip a pig 6 or 7 feet away.



Pig Catcher.

Pig Curiosities.—Some years ago a curiosity in the shape of a tree climbing pig was shot by a Mr Le Mortemore on Tinana Creek, Queensland. For a number of years the wild pigs had been numerous in his locality and his theory was that the original or common pig, must have amalgamated to a certain extent with some aboriginal animal, or that the necessities of climate, etc., had caused the variety. The captured animal weighed about 1 cwt, and was pretty fat, with bristly brown fur, small black spots, snout and ears like a pig, but the jaw was furnished with front teeth like a rodent; it had large canines and powerful back grinders. The forefeet were furnished with hook-like claws; the hind ones had two hook claws on each hoof. The tail was thick, about a foot long, highly prehensile, and in a state of rest was usually carried in what is known as a Flemish coil. The animal was also furnished with a pouch, which it only appeared to use for carrying a supply of food in while it was travelling to fresh pastures. It is quite possible that this variety was due to the breeding of the common pig with the Queensland tree-climbing kangaroo.

Wild Boars in France.—A popular delusion exists that the wild boars to be found in certain French forests are very ferocious, and attack men and other animals with fury whenever they come in contact with them. From a statement in a French paper we find this is not so, that they avoid attack as much as possible, and only when brought to bay at the last extremity use their ferocious tusks in self-defence, fighting for life with much tenacity. It appears that large numbers of these animals are hunted in the forests surrounding Paris, and within a radius of 12 miles of the city, and the slaughter is considerable. They are a long-lived porcine race, for if left alone they last till about thirty years of age, and as they breed in litters of six to eight each time, the multiplication of the species is very considerable, rendering boar-hunting a necessity for the purpose of keeping down surplus population.

Sicilian Pigs.—One of the British consul's reports from Palermo contains some curious details respecting the breeding of pigs in Sicily, which in certain districts, and especially in mountainous parts, are reared in great numbers. Nearly all the small towns are overrun with them, and they are not only useful for food, but act as scavengers to the dirty streets. They are enticed, in towns, to devour the filthiest food by sprinkling bran over it. In the mountainous districts, where there are oak forests, they are driven up to the high regions to feed on acorns. A good acorn year is a godsend to those who possess oak forest. For each full-grown pig as much as 10s. is paid for the acorn season to the owner of the forest; two medium-sized pigs and three small ones are admitted at the same rate. The pigs, which are thus driven about under the superintendence of boy swine-herds, are all ear-marked, and speedily become accustomed to their new conditions of life. They form among themselves a sort of Republican government, and are docile to the calls and windings of the horn of their young guardians, who are clothed in very plain and primitive fashion, and live simply on bread and water, taking out with them every day loaves baked in the ovens of the farm, and in shape precisely the same as those that have been found in the baker's shops at Pompeii. The pigs are driven back home at night and housed to avoid disease, and, strange to say, their sheds are scrupulously clean. It is said that they establish internally a kind of sanitary jurisdiction, and that a pig which is found a delinquent against the sanitary rules, is attacked with fury by the rest and killed. The Consul has seen covered pig sties made of stone, and capable of holding 300 or 400 pigs, and found them dry and clean and quite dusty. The only value of the pigs consists in their being sold as fresh pork and for the making of sausages. They fatten well upon acorns, and their flesh is very white and tasteful, whereas the colour of the pork in the towns is quite dark. The sausages which are made are also very tolerable, but the curing of pork for ham or bacon is unknown in Sicily. Pigs in Sicily enjoy as much social distinction as in Ireland; they, with the poultry and other animals, share their master's tenement, and will trot after him daily to and fro on his way to his work in the fields. Perhaps pork is more commonly eaten than any other kind of meat in the islands. The boy swineherds and goatherds who tend the flocks in the mountains receive their daily provision of bread cooked in the arm buildings, and get nothing else in winter or summer, not even the severest weather, and never, as a rule, even taste "pasta" or macaroni. Besides the daily provision of bread they receive a dole of 75f. a year, paid in three parts, out of which they find their clothes. A great part of the year the lads sleep in the open air or in the temporary straw huts, often in rainy or snowy weather; and with such a hard life, and nothing but coarse bread and water from year's end to year's end, their cheerfulness and good humour appear quite marvellous; many of them are bright, intelligent, lively lads, and graceful and courteous in their demeanour.

Pig Feeding.—The results of some interesting and instructive experiments on the feeding of pigs were published in the Journal of Royal Agricultural Society of England by Sir John Bennet Lawes, Bart., D.C.L., Sc.D., F.R.S., and

Sir J. Henry Gilbert, LL.D., Sc.D., F.R.S., in 1895. The experiments were carried out at Rothamsted, and are summed up as follows :—

"In the selection of the experiments with pigs, for calculating whether more fat was stored up than could possibly have been derived from the ready formed fat and the nitrogenous substance of the food, some have been taken in which the proportion of the nitrogenous to the non-nitrogenous constituents of the food was abnormally high, and others in which it was fairly normal, or even low. In all cases, the experiments were conducted for periods of not less than eight or ten weeks ; and the amounts, both of total increase and of fat stored up, were so large in proportion both to the original weight of the animal and to the amount of food consumed, that the data obtained may safely be relied upon for the settlement of the question at issue.

In the upper portion of the next Table are recorded some particulars of the nine experiments selected for calculation, namely—the description of the food, the number of animals experimented upon, the duration of the experiment, the original and final live weights, the increase per head and on 100 original weight, the percentage of carcase in fasted live weight, and the amount of crude non-nitrogenous to 1 of crude nitrogenous substance in the food.

The middle division of the table shows, for 100 increase in live weight—the amount of nitrogenous substance consumed in the food, the amount of it estimated to be stored up in the increase, and the quantity remaining, and therefore possibly available for the formation of fat. Next there are given—the estimated amount of fat in the increase, the amount ready-formed in the food, and the difference—that is, the amount newly-formed. There are then given—the amounts of carbon in the estimated newly-formed fat, the amounts in the available nitrogenous substance *minus* that in the urea formed, supposing the whole of the nitrogen not stored up in increase to contribute to such formation ; and lastly, the difference, that is, the amount of carbon available from the nitrogenous substance for the formation of fat, more or less than that required for the amount of fat produced.

Then, in the bottom division of the table are shown, for 100 of carbon in the estimated produced fat—the amount available from the nitrogenous substance, and the amount not available from that source, in each experiment ; the amount not so available representing, of course, the proportion required from other sources.

It is hardly necessary to point out that, according to the above mode of illustration, the figures show not only the utmost proportion of the stored-up fat which could possibly have had its source in the nitrogenous substance of the food, but notably more than could possibly have been so derived. Thus, to say nothing of other considerations, it has been assumed, for simplicity of illustration and for the sake of argument, that the whole of the nitrogenous substance of the food not stored up as increase would be perfectly digested, and be available for fat-formation ; and that, in the breaking up of the nitrogenous substance for the formation of fat, no other carbon compounds than fat and urea would be produced ; and lastly, that the whole of the ready-formed fatty matter of the food has contributed to the fat stored up. It is obvious, however, that these assumptions are in part improbable, and in part quite inadmissable ; whilst the tendency of the error is, in each case, to show too large a proportion of the stored-up fat to have been possibly derived from the ready-formed fat and the nitrogenous constituents of the food.

It is obvious, therefore, that where the figures show an excess of carbon available from nitrogenous substance over that which would be required if the produced fat had been formed from it, the excess is over-estimated ; and, on the other hand, that where they show a deficiency of nitrogenous substance for such formation, the deficiency is under-estimated ; so that, in fact, the amount of fat required to be derived from other sources would be greater than the figures indicate. Indeed, according to the mode of calculation adopted, 100 of nitrogenous substance would yield 62 parts of fat ; but it has been fully admitted in subsequent discussions that at most 51·4 parts of fat could possibly be derived from 100 parts of proteid substance ; and more recently a much lower figure has been adopted.

After these general remarks, we may now turn to the consideration of the results of the different experiments.

In experiment 1, two pigs of the same litter, of almost exactly equal weight, and, as far as could be judged, of similar character, were selected. One was killed at once, and the amount of total dry or solid matter, of nitrogenous substance, of fat, and of mineral matter, determined in it. The other was then fed for a period of ten weeks on a mixture consisting of—bean meal, lentil meal, and bran, each 1 part, and barley meal 3 parts, given *ad libitum*. It was then weighed, killed, and its composition determined as in the case of the other animal. In fact, the object of the experiment was to determine the composition of a "store" and of a "fat" pig, and to estimate the composition of its increase whilst fattening ; and the data thus provided have formed the basis of the estimate of the fat in the increase, not only in the case of experiment 1, to which they directly apply, but in that of each of the other eight experiments, the results relating to which are recorded in the table. On this point it may be observed that, taking into consideration the weight and condition of the animals at the commencement, the character of the foods, the length of the fattening period, the proportion of increase upon the original live-weight, and the final condition of the animals, it may, perhaps, be concluded that the tendency of error in the calculations would be to give the proportion of fat in the increase somewhat too high in experiments 2 and 3, and somewhat too low in experiments 6, 7, 8, and 9. In experiments 4 and 5, however, the animals were the fattest in the series ; and it will be seen further on, that the high estimates of fat in the increase in their case are probably not too high —indeed, in experiment 5 even somewhat too low.

It might be supposed that, at any rate in the case of experiment 1, the results would be admirably adapted for our present purpose. But that experiment was made in 1850, that is nearly 45 years ago, and before we had acquired sufficient evidence against the view then prevailing, namely, that the increase of the fattening animal was largely dependent on the richness of the food in nitrogenous constituents ; and everybody having experience in the fattening of pigs will admit that, in this case, the food was much more highly nitrogenous than is recognised as most favourable for the fattening of the animal. In fact, it is seen that the proportion of the crude non-nitrogenous to 1 of crude nitrogenous

substance in the food was only 3·6, instead of about 6, as in barley meal. There was, therefore, an excess of nitrogenous substance consumed.

Referring to the middle division of the table, the calculated results show that, for 100 increase in live weight, 100 of nitrogenous substance was consumed in the food. Of this, it is estimated that only 7·8 parts were stored up in the increase, leaving 92·2 parts available for the possible formation of fat.

bottom division of the table, for 100 carbon in the estimated newly-formed fat, 120·2 parts were available from the nitrogenous substance consumed in the food.

Here, then, the calculations afford no evidence that fat must have been produced from carbohydrates. But, as already explained, the mode of estimate adopted assumes the whole of the ready-formed fat in the food to have been stored up, and the whole of the carbon of the nitrogenous substance, beyond that in the animal increase, and in the urea formed,

Relation of the Total Fat in the Increase to the Ready-Formed Fatty Matter in the Food, and of the Carbon in the Fat produced within the Body to that in the Nitrogenous Substance consumed, in Experiments with Fattening Pigs.

Experiments .	1	2	3	4	5	6	7	8	9
———	Bean meal, lentil meal, and bran, each 1 part, barley meal 3 parts.	Bean meal, lentil meal, bran, and maize meal, each *ad lib.*	Mixture, equal parts bran and lentil meal *ad lib.*	Maize-meal *ad lib.*	Barley-meal *ad lib.*	3 lb. 3 oz. lentil meal, and 9 oz. bran, per head per day and			Lentil meal, bran, sugar, and starch, each *ad lib.*
						Sugar *ad lib.*	Starch *ad lib.*	Sugar and starch, each *ad lib.*	
Conditions, and Actual Results of Experiments.									
Number of animals	1	3	3	3	3	3	3	3	3
Duration of experiment—weeks	10	8	8	8	8	10	10	10	10
Original live weight, per head, lb.	103	143	147	144	149	95	95	94	97
Final live weight per head, lb.	191	228	248	217	246	178	178	184	201
Increase in live weight per head, lb.	88	85	101	73	97	83	83	90	104
Increase on 100 original weight	85·4	59·7	68·9	51·3	64·9	86·4	87·0	96·8	106·8
Per cent. carcase in live weight	82·8	83·9	81·9	85·4	...	83·1	80·1	81·7	80·8
Non-nit. sub. to 1 nit. sub. in food (crude)	3·6	3·3	2.0	6·6	6·0	4·1	4·1	4·7	3·9
Per 100 Increase in Live Weight.									
Nitrogenous substance — In food	100·0	107·0	138·0	57·0	64·0	81·0	81·0	74·0	82·0
Nitrogenous substance — In increase	7·8	6·1	6·7	5·3	6·5	7·5	7·6	8·0	8·2
Nitrogenous substance — Available for fat formation	92·2	100·9	131·3	51·7	57·5	73·5	73·4	66·0	73·8
Fat — In increase	63·1	73·9	69·6	79·0	71·2	64·1	63·9	62·0	59·9
Fat — In food	15·6	20·4	11·2	26·3	12·4	7·9	7·9	7·3	6·6
Fat — Newly formed	47·5	53·5	58·4	52·7	58·8	56·2	56·0	54·7	53·3
Carbon — In newly-formed fat	36·6	41·2	45·0	40·6	45·3	43·3	43·1	42·1	41·0
Carbon — In available nit. sub. *minus* urea	44·0	48·1	62·6	24·7	27·4	35·1	35·0	31·5	35·2
Carbon — More (+) or less (−) in nit. sub. than required	+7·4	+6·9	+17·6	−15·9	−17·9	−8·2	−8·1	−10·6	−5·8
Per 100 Carbon in Estimated Newly-formed Fat.									
Carbon — In available nit. sub. *minus* urea	120·2	116·7	139·1	60·8	60·5	81·1	81·2	74·8	85·9
Carbon — Not available from nitrogenous substance	...	...	...	39·2	39·5	18·9	18·8	25·2	14·1

It is next seen, that the 100 of increase was estimated to contain 63·1 parts of fat, whilst the food supplied only 15·6 parts, leaving, therefore, at least 47·5 parts to be produced within the body. The figures show that this would require 36·6 parts of carbon, whilst 44·0 parts are estimated to have been available from the nitrogenous substance of the food; leaving, therefore, according to the mode of calculation adopted, 7·4 parts more carbon available than were required for the formation of the produced fat. Or, as shown in the

to have been utilised for fat formation. Neither of these assumptions is, however, admissable; and it will be seen further on, when due correction is made in regard to these points, that even in this experiment, with so abnormally high a proportion of nitrogenous substance in the food, it is pretty certain that some of the produced fat must have had its source in the carbohydrates.

In experiment 2, the food consisted of bean meal, lentil meal, bran, and maize meal, each given separately, and *ad*

libitum; and in experiment 3, of an equal mixture of bean meal and lentil meal, also given *ad libitum.* It is seen that, in both cases, the proportion of crude non-nitrogenous to 1 of crude nitrogenous substance in the food was even lower than in experiment 1; being, in experiment 2, 3·3, and in experiment 3, only 2·0, against 3·6 in experiment 1. Here again, as might be expected, with so high a proportion of nitrogenous substance in the food, the calculations show that there was more than sufficient carbon available from the nitrogenous substance of the food for the formation of all the fat that was estimated to be produced.

Experiments 4 and 5 show a very different result. In experiment 4, the food consisted of maize meal alone, and in experiment 5 of barley meal alone, in each case given *ad libitum.* In America especially, maize meal is largely used for the fattening of pigs, almost, if not quite, alone; and in our own country barley meal is undoubtedly recognised as the most appropriate fattening food of the animal. It is seen that, in experiment 4, with maize meal, the proportion of crude non-nitrogenous to 1 of nitrogenous substance in the food was 6·6, and in experiment 5, with barley meal, it was 6·0; or, in both cases, nearly that which is recognised as appropriate in the fattening food of the animal, but rather low in nitrogenous substance.

Accordingly, the calculations show much less nitrogenous substance consumed for the production of 100 increase in live weight, and much less left available for fat formation, after deducting the amount estimated to be stored up in the increase. Then, as to the fat, the animals were undoubtedly much fatter than the analysed "*fat*" pig. Deducting the amounts of fat supplied in the food from that in the increase, there remained, in the one case 52·7, and in the other 58·8 parts, formed within the body, requiring in the first case 40·6, and in the second 45·3 of carbon; whilst the amounts of carbon estimated to be available from the nitrogenous substance of the food were only 24·7 and 27·4 parts; leaving, in the one case 15·9, and in the other 17·9 parts, to be provided from other constituents of the food. Or, if the calculations are made for 100 *carbon in the estimated newly-formed fat*, the figures show that in one case 39·2, and in the other 39·5 per cent. of the total carbon of the produced fat must have been derived from other constituents of the food.

In other words, even on this mode of calculation, nearly 40 per cent. of the newly-formed fat must have had its source in the carbohydrates. We shall see further on, that even a considerably larger proportion still must in reality have been so derived.

The peculiarity of the experiments 6, 7, 8, and 9 was, that the food contained less ready-formed fat than in any of the other cases, and that a large proportion of the non-nitrogenous substance supplied was in the form either of pure starch, or pure sugar, or both. In experiments 6, 7, and 8, a fixed quantity of lentil meal and bran, averaging 3 lbs. 3 ozs. of lentil meal and 9 ozs. of bran, was given per head per day; and, in addition, in experiment 6, sugar *ad libitum*, in experiment 7, starch *ad libitum*, and in experiment 8, sugar and starch, each separately, *ad libitum.* Lastly, in experiment 9, lentil meal, bran, sugar, and starch, were each given separately and *ad libitum.* It will be seen that the proportion of crude non-nitrogenous to 1 of crude nitrogenous substance was 4·1 in experiments 6 and 7, 4·7 in experiment 8, and only 3·9 in experiment 9; that is, the food contained a higher proportion of non-nitrogenous substance than in experiments 1, 2, and 3, but considerably lower than in experiments 4 and 5. Accordingly, the final result of the calculations is intermediate between that for the other two series.

To go a little into detail, it is seen that, for 100 increase in live weight, the amount of nitrogenous substance estimated to be available for fat formation was, in this series, intermediate between that in the other two. With much less fatty matter supplied in the food, the amount of fat estimated to be newly formed was about the same as in the other cases. The amount of carbon estimated to be available for fat formation from the nitrogenous substance of the food was, in each case, notably less than the amount required for the production of the newly-formed fat. The indication is, therefore, that, in each case, a considerable proportion of the produced fat must have had its source in other than the nitrogenous constituents of the food.

The bottom division of the table shows that, reckoned for 100 carbon in the estimated newly-formed fat, in the first case 18·9, in the second 18·8, in the third 25·2, and in the fourth 14·1 per cent., or, on the average, about 20 per cent. of the whole, must have been derived from other sources—in fact from the carbohydrates. Nor can there be any doubt that the figures under-estimate the proportion of the produced fat which could not have had its source in the albuminoids of the food.

The general result of the whole series of experiments is, then, that when the food of the fattening animal contains an abnormally high amount and proportion of nitrogenous substance, enough of it will probably be available for the possible formation of all the fat produced in the body; but that, when the amount and proportion of such substances in the food are only normal, or low, there will remain a large proportion of the produced fat which could not have had its source in the proteids, and must have been derived from the carbohydrates."

The following results are also interesting, and have been arrived at by experiments conducted by Herr Docent Fjord of Denmark :—

The preface of the translator (R. H. Beamish) says: "The comparative values of separated milk and ordinary skim milk have been solved for some time past by the Danes, with the result that the former is extensively used without any fear of ultimate danger."

We may observe that the practical results derived from these trials are divided into three parts.

A. 1 lb. of separated milk is equal to 2 lbs. of whey.

B. 1 lb. of barley can be substituted for 1 lb. of rye.

C. 1 lb. of barley can be substituted for 6 lbs. of separated milk or 12 lbs. of whey.

That is to say that 1 gallon of separated milk is equal to 1¾ lb. of barley or rye. By other form of comparison the same facts may be rendered somewhat more intelligible.

Barley at	4/	per cwt. is equal to	separated milk	at	¾d.	per gallon.
,,	5/5	,,	,,	,,	1d.	,,
,,	8/1	,,	,,	,,	1½d.	,,
,,	10/10	,,	,,	,,	2d.	,,

At the same time, it must be observed that evidently the Danes do not depend upon the exclusive use of either milk or corn; but feed them in combination. During these experiments the animals were given from 1 to 1½ gallons of separated milk combined with from 2½ to 5 lbs. of corn, according to the size of the pigs and the period of fattening.

Barley is the principal form of corn in use, though wheat, maize, and rye are also given.

The average increase of weight from the combination of separated milk and corn has varied between ¾ and 1 lb. per diem."

The Irish Method of Pig Feeding.

The following is a copy of a useful circular issued by the Royal Dublin Society, and fairly represents the opinions of Irish curers on feeding of pigs :—

"*Breeding and Feeding of Swine.*—Irish bacon has long held a high position in the English markets, and it is a matter of great importance to Irish farmers that it should continue to do so.

In these days of keen competition, when several Continental countries have turned their attention to curing bacon for the English markets, and, by careful breeding and feeding, have been able to encroach on those markets hitherto held by Irish curers, every effort should be made by owners of swine throughout Ireland to assist the curers in the struggle in which they are engaged. In doing so they will only be attending to their own interests, as it is self-evident that the price of bacon is more a farmer's question than one affecting bacon curers or provision merchants. There are two all important matters connected with the bacon trade which are entirely in the hands of farmers, and which ought to receive every attention—viz., the breeding and feeding of pigs.

Breeding.—Different breeds suit different districts, but at present white breeds are most in favour with buyers in Ireland. While trying to impress upon farmers the necessity of fresh blood and careful attention to breeding, it may be well to warn them against attempting to introduce a new breed of pigs into a district. It is much the safer way for farmers to aim at the improvement of pigs which have been long bred in a district than to attempt to introduce new breeds. While this is so, care ought to be taken in the selection and introduction, from other districts, of high-class male animals to develop the points essential in good pigs.

Speaking generally, short, dumpy boars and sows ought to be avoided, as it will be found that extra length of body not only adds much to the weight of the carcase but ensures a larger proportion of lean meat to the gross weight.

Every care ought to be taken to prevent consanguinity or close breeding. The evil effect of close breeding shows itself sooner in the case of pigs than in any other of our domestic animals, and, therefore, fresh blood is most essential.

In practice it will be found that a well-shaped pig can be reared, fed, and brought, in a shorter space of time, to a greater weight upon a smaller amount of food than a mongrel bred one ; while the bacon and hams cut from the carcase of a well bred pig are superior in quality and command a higher price in the market. Even in the heavily-stocked markets of the present day there is still "room at the top," and to-day there is a very great margin in the wholesale and retail markets between the price of ordinary bacon and hams and those classed as best quality.

Feeding.—The flesh of pigs is soft if fed on brewery and distillery grains. Turnips and mangolds are unsuitable for producing good bacon.

The following foods are suitable for producing good bacon :—

Potatoes (cooked).
Milk.
Barley meal.
Oatmeal and crushed oats.
Pollard bran.
Wheat (ground).
Rye meal.
Indian corn (used sparingly) ground and cooked.

Separated Milk.—It is said that one of the principal reasons why Danish bacon has taken such a hold on the English market, and has been so profitable to the farmers in Denmark, is the fact that they have fed their pigs largely on separated milk. Nor is milk feeding a new idea. For generations the cottagers in Cumberland and Yorkshire have made a point of buying skimmed milk for their pigs for at least a month before they were killed for family use. Although seemingly an expensive food, the use of milk has been found to add to the flavour of the meat and also to prevent waste in cooking.

When creamery separated milk is available, it may be used fresh from the separators, but if it has to be carried, or kept over, it ought to be heated to a temperature of 180° Fahr. at the creamery immediately after it is separated.

How to make Pigs pay.

Rules by the Irish Pig Improvement Association.—One day with another the pig that commands the highest price is an animal which, though well finished, must not be over fat, and which turns the scale dead weight at about 12 stone. (The live weight of this animal would be about 15½ to 16 stone.) This type of hog is called a "bacon" pig, and is that required for the London long-side singed bacon trade.

"Berwicks" are small plump pigs averaging about 8 stone dead weight, that is, ranging between 7 and 8½ stone. The price for these is usually the same as for bacon pigs, but at certain times of the year, through scarcity, they may fetch 2s. to 3s. per cwt. more. They are used for the ham and middle trade, and the manufactured article is almost entirely sold in Ireland.

Hogs are an intermediate class, that is, ranging between 8½ and 11 stone dead weight, are by no means so saleable, and rarely command as high a figure as either bacon pigs or "Berwicks." They are called in the trade "six-sides," and at certain seasons of the year, notably the Spring, are greatly depressed in price, being often quoted at 4s. to 5s. under the other classes.

There is another type of hog—the "overweight." The highest weight generally killed at the factories is 13 stone. There are, however, a few killed some pounds heavier than this, but there is always some 2s. or 3s. per cwt. less paid for them, as the class of bacon manufactured from them is inferior, and has to be sold at considerably less money in the English markets.

All the above classes of pigs must be well fed, but not over fed. A good bacon pig of 12 stone ought to be produced in seven months from its birth. It should not be crammed, neither should it be half starved, but fed steadily and regularly. Pigs fed steadily and regularly will give the most satisfactory results to the feeder when weighed in the factories. A hog which has been half starved at any period of its life, even though well fed afterwards, will not do so.

The flesh of hogs is soft and flabby if fed on brewery or distillery stuff or on turnips or mangolds, and in comparison to their size their weight in the scale is miserable. They may deceive (we doubt it) the buyer who buys by "guess," but they will not deceive the scale weight.

The best classes of food for pig feeding are: potatoes (cooked), milk, barley, meal, oatmeal, crushed oats, pollard, bran, ground wheat, rye meal, Indian corn (the latter should be only used sparingly and in conjunction with other foods, such as pollard, bran, or milk, and should always be ground as fine as the mill can make it, and thoroughly cooked, otherwise the Indian corn passes through the animal undigested, and to the loss of the feeder).

The secret of making money by pigs is not to rush into them nor out of them. Never keep too many; never keep too few. The fault in the past has been that feeders ran in to buy when hogs were dear, and stayed at home when they were cheap. Try the reverse and the result will surprise you.

You will not get well-shaped pigs from a badly shaped boar; neither will you get thrifty pigs from an unthrifty sow. If you do not keep your pigs clean and dry they will not pay you. A pig, any more than a human being, will not thrive on a foul, damp bed.

The best thriving pigs we have ever seen were those produced from an ordinary well-shaped country sow and a thorough-bred York boar. The services of this latter class of animal can easily be had nowadays. A long-legged ungainly boar will get a leggy, flat-ribbed, cat-hammed, herring-gutted miserable class of pigs, which will pay nobody and deceive nobody as to their quality except, perhaps, the man who feeds them. The tall leggy hog used ignorantly to be thought to deceive the buyer who purchased by "guess," but it will not deceive the factory weighmaster.

No matter how low prices may be, if it does not pay to feed pigs, it certainly does not pay to starve them.

The way to have cheap stores is to breed them yourself.

A good sow is easily fed, and is the best savings bank you could have.

The day you buy is the day you sell. If you pay too much for the store you will want (but will not get) too much for the bacon pig. Where a proper sow is kept, young pigs can be produced for 1s. a week of their age—that is to say, 8 weeks 8s., 10 weeks 10s., and so on up to 12 weeks. Why should the feeder pay practically double this for them.

One great secret of pig raising is—when pigs are high in price don't lose your head and throw your money away; when pigs are low don't lose your head and throw your pigs away.

During the years 1896 to 1900, the Agricultural Committee of the Wiltshire County Council conducted a large number of experiments in the feeding of pigs, from which the following results have been taken:—

The primary objects of the experiments were to determine the relative values of the various foods generally given to fattening pigs, and the best combinations of these for the production of the best quality of lean bacon—such as that for which the little town of Calne is so justly noted.

For the purpose of these experiments suitable buildings, consisting of styes and meal house for the fattening of 40 pigs at a time, were especially erected. In the construction of the buildings it will be seen that special attention was given to ventilation and cleanliness, for it is a great fallacy to assume that pigs thrive amidst filthy and unhealthy surroundings. Later a machine on which five fat pigs could be weighed at once was added to the equipment; and a part of each inner stye was covered with a movable spar floor, which was an improvement.

Specification of Pig Styes and Meal House.

EXCAVATOR.

Remove all mould six inches deep and place same where required on land.

Concrete.—Six inches deep of concrete all over buildings.

Meal House.—To have three inches of cement concrete under floor mixed with glass.

Freestone.—Fix blocks of freestone to plug plates to.

Brickwork.—Build four courses of nine inch brickwork, top course to be bull-nosed bricks on edge set in cement except outer styes.

Inside Floor.—Inside floor to be Calne paving well bedded in coal ash mortar.

Outside Floor.—To be cement concrete to proper run, and form gutter to grating in middle of styes.

Drains.—Four inch common pipe drain from grating to tank.

Tank.—Four feet square, built of nine inch bricks in cement with proper cover, oak frame, and elm lid, with wrought-iron joints.

Paths.—Form path in front of styes, four feet wide, with broken stone.

Boiler.—Fix 30 gallon boiler in meal house with all necessary fittings.

CARPENTER.

All timbers to be of best red deals, except where otherwise described. To be built with one inch country cut red deal boards, grooved and tongued together, framed on brickwork.

Sills.—$4\frac{1}{2} \times 3$ red deal, nails and braces 4×2.

Plates.—4×3. Meal house posts to be $4\frac{1}{2} \times 3$ with one inch ledge. Match board door with all fittings, and painted.

Oak Posts.—Fix oak posts to outer styes 5×4, rails 4×2 red deal, morticed into posts, and board round with one inch country cut red deal.

Fronts.—To be made with half swing fronts with wrought-iron fittings.

Trough.—Provide and fix twelve inch iron troughs to each stye.

Roofs.—Cover the roof with half inch white match board, 22 gauge galvanised iron with roll crease, each sheet to be well screwed on.

Spouting.—Fix four inch half round spouting to eaves with stock pipe and all necessary fittings, and connect same to drain.

Painting.—Paint galvanised iron roof with two coats of oxide paint.

Door and Window.—Paint same with three coats of oil paint.

Tarring.—Tar all wood work at finish except inside of inner styes.

Altogether 18 sets of experiments have been made on a total of 720 pigs, the average weight of which at commencement has ranged from 83 lbs. to 141 lbs., and the duration of fattening has varied from 6 to 14 weeks.

Summary of Chief Deductions to be drawn.—Column 6—On reference to this column it will be found that the diets which gave the highest weekly increase in live weight were:—

1	Maize meal, separated milk and potatoes	14·5 lbs.
2	Barley meal, separated milk and potatoes	14·4 ,,
3	Barley meal and separated milk	14·0 ,,
4	Maize meal and separated milk	13·0 ,,
5	Barley meal and bean meal	12·3 ,,
6	Barley and pea meals	12·1 ,,

From column 8a, it appears that—(*a*) On killing and dressing, maize fed pigs lose less weight than barley fed ones, whether the meals referred to were fed alone or in conjunction with other foods; (*b*) The addition of milk to barley appeared to cause the pigs to lose slightly less on killing, but a similar addition to maize the contrary effect; (*c*) The

Summary of the Chief Results obtained with the 34 Diets.

	1	2	3	4	5	6	7	8	8a	9					10	11	12	13	14	15
FOODS.	Number of times tried.	Number of Pigs experimented with.	Average number of weeks fed.	Average live weight in lbs. at commencement of fattening.	Average live weight in lbs. at the end of fattening.	Average weekly gain in live weight, in lbs.	Average dressed weight in lbs.	Percentage of live weight as Dressed Weight.	Percentage loss on killing and dressing.	Scale placed in by Messrs Harris & Co.					Food consumed per 100 lbs. increase in live weight. Milk in gallons. Other foods in lbs.	Food consumed per 100 lbs. estimated increase in dressed weight. Milk in gallons. Other foods in lbs.	Estimated Cost of producing one score dressed weight.	Points for quality of carcase for bacon production.	Estimated value of food for quantity & quality of carcase and rapidity of fattening.	Estimated Comparative Cost per unit value of food.
										A	B	C	D	Small			s. d.			
Barley meal	2	20	9	122·3	212·6	10·0	157·6	74·2	25·8	15	3	1	...	1	437 Barley	577 Barley	5 $1\frac{3}{4}$	984	645	26
Maize meal	2	20	9	121·7	198·8	8·6	153·0	77·1	22·9	9	6	2	...	3	492 Maize	568 Maize	4 $6\frac{3}{4}$	952	595	25
Bibby's meal	1	9	14	98·0	156·2	4·3	116·9	73·9	26·1	5	...	...	...	4	643 Meal	852 Meal	7 $7\frac{1}{4}$	917	260	96
Calthorpe's meal	1	10	14	98·0	171·6	5·3	120·1	70·0	30·0	3	...	...	...	7	571 Meal	864 Meal	7 $8\frac{1}{2}$	866	263	96
Barley meal and separated milk	6	59	7	110·2	208·3	14·0	155·8	74·8	25·2	50	8	1	...	...	291 Barley 53·4 Milk	376 Barley 67 Milk	4 $5\frac{3}{4}$	999	943	16
Maize meal and separated milk	3	30	7	122·7	214·0	13·0	164·5	76·8	23·2	13	7	6	2	2	303 Maize 60 Milk	363 Maize 72 Milk	4 2	952	892	15
Barley meal and bran	3	29	11	121·3	201·2	7·3	145·1	72·1	27·9	27	1	...	...	1	288 Barley 144 Bran	405 Barley 203 Bran	5 $0\frac{3}{4}$	998	449	37
Maize meal and bran	2	19	9	135·8	190·0	6·0	142·5	74·9	25·1	15	1	...	...	3	312 Maize 156 Bran	382 Maize 191 Bran	4 $5\frac{1}{4}$	973	411	35
Barley meal and potatoes	3	40	$8\frac{1}{3}$	121·2	215·6	11·3	158·6	75·6	24·4	27	10	2	...	1	374 Barley 260 Potatoes	474 Barley 326 Potatoes	4 10	985	719	22
Maize meal and potatoes	3	40	$8\frac{1}{3}$	120·6	195·2	9·0	149·1	76·3	23·7	20	6	7	...	7	406 Maize 327 Potatoes	497 Maize 400 Potatoes	4 8	947	608	25
Barley meal and pea meal	2	29	7	132·8	217·7	12·1	162·1	74·5	25·5	23	4	1	1	...	322 Barley 88 Peas	432 Barley 119 Peas	5 2	991	808	21
Maize meal and pea meal	4	38	$8\frac{1}{4}$	116·3	194·9	9·5	147·1	75·5	24·5	16	12	2	...	8	314 Maize 102 Peas	400 Maize 130 Peas	4 $7\frac{3}{4}$	954	630	24
Barley meal and maize germs	1	10	14	98·0	201·3	7·4	154·0	76·5	23·5	7	3	...	...	...	359 Barley 119 Germs	449 Barley 150 Germs	5 $5\frac{3}{4}$	992	512	35
Barley meal and bean meal	1	20	7	123·0	209·3	12·3	157·0	75·0	25·0	17	2	1	...	...	311 Barley 104 Beans	415 Barley 138 Beans	5 $7\frac{1}{2}$	997	838	22
Maize meal and bean meal	3	28	$8\frac{2}{3}$	110·3	189·6	9·2	143·3	74·9	25·1	19	4	3	...	2	311 Maize 104 Beans	392 Maize 130 Beans	4 $11\frac{1}{2}$	975	619	26
Maize meal and ash	1	10	11	105·0	168·7	5·8	129·7	76·3	23·7	1	3	...	2	4	543 Maize	653 Maize	5 4	881	372	41
Maize meal and mangolds	1	10	13	85·9	133·8	3·7	101·9	76·2	23·8	...	...	1	...	9	611 Maize 450 Mangolds	747 Maize 550 Mangolds	6 7	816	216	100

Maize meal and crushed oats	1	10	11	103·1	164·1	5·5	121·3	73·9	26·1	5	1	..	...	4	268 Maize 268 Oats	356 Maize 356 Oats	7 1	921	337	73
Barley meal Reckitt's meal and separated milk	1	20	7	115·4	191·6	10·9	142·0	74·1	25·9	14	3	...	...	3	265 Barley 88 Reckitt's meal 31 Milk	349 Barley 116Reckitts'meal 40 Milk	4 11½	970	701	23
Maize Meal Reckitt's meal and separated milk	1	20	7	116·1	197·8	11·7	149·0	75·3	24·7	9	5	2	...	4	264 Maize 87 Reckitt's meal 28 Milk	336 Maize 112Reckitts'meal 36 Milk	4 5¼	945	759	19
Barley meal separated milk and potatoes	2	20	8	121·9	236·5	14·4	179·9	76·1	23·9	10	7	3	...	...	296 Barley 146 Potatoes 49 Milk	372 Barley 184 Potatoes 62 Milk	4 8	975	969	16
Maize meal separated milk and potatoes	2	19	8	120·9	237·1	14·5	185·0	78·0	22·0	6	4	7	2	...	274 Maize 143 Potatoes 48 Milk	328 Maize 172 Potatoes 58 Milk	3 11	944	1000	13
Barley Meal maize meal and separated milk	2	59	7	121·4	205·2	12·0	161·4	78·5	21·5	37	17	3	1	1	332 Meal 58 Milk	375 Meal 66 Milk	4 3½	982	894	16
Barley meal wheat meal and separated milk	1	20	9	92·0	194·5	11·4	148·4	76·3	23·7	17	3	...	...	...	166 Barley 98·5 Wheat 61 Milk	209 Barley 124 Wheat 76 Milk	4 9½	1000	790	20
Maize meal cotton cake and treacle	1	8	7	107·2	159·3	7·2	117·8	73·9	26·1	3	1	...	...	4	357 Maize 49 Cake 30 Treacle	468 Maize 64 Cake 39 Treacle	4 11¾	900	445	37
Maize meal bean meal and mangolds	1	10	13	87·7	188·4	7·7	143·1	76·0	24 0	5	2	1	...	2	276 Maize 92 Beans 214 Mangolds	351 Maize 117 Beans 273 Mangolds	4 9	947	504	32
Maize meal pea meal and mangolds	2	19	10	104·4	169·4	6·5	127·4	75·5	24·5	9	2	...	...	8	354 Maize 118 Peas 180 Mangolds	445 Maize 148 Peas 229 Mangolds	5 8½	917	412	46
Maize meal crushed oats and mangolds	1	10	13	88·2	176·1	6·8	133·8	76·0	24·0	2	5	...	...	3	216 Maize 216 Oats 245 Mangolds	274 Maize 274 Oats 311 Mangolds	5 9½	921	431	44
Barley meal pea meal and crushed oats	1	9	7	128·8	207·8	11·3	151·2	72·8	27·2	6	1	1	...	1	282 Barley 57 Peas 57 Oats	422 Barley 86 Peas 86 Oats	5 8¾	968	693	27
Maize meal pea meal and crushed oats	1	8	7	133·2	215·8	11·8	161·3	74·7	25·3	5	3	...	...	...	287 Maize 89 Peas 59 Oats	370 Maize 115 Peas 76 Oats	5 1¾	988	792	21
Maize meal pea meal and bean meal	1	18	8	116·3	198·5	10·3	152·1	76·6	23·4	13	4	...	1	...	310 Maize 54 Peas 49 Beans	380 Maize 67 Peas 59 Beans	4 7¼	988	727	21
Maize meal pea meal and parsnips	1	10	7	128·8	186·2	8·2	142·1	76·3	23·7	7	2	...	...	1	444 Meal 84 Parsnips	530 Meal 100 Parsnips	4 10½	977	588	27
Maize meal pea meal and bran	1	10	7	125·8	179·2	7·6	134·7	75·2	24·8	7	...	...	...	3	383 Meal 90 Bran	477 Meal 112 Bran	4 11¾	947	507	32
Maize meal pea meal and shorts	1	10	7	124·4	176·4	7·4	137·0	77·7	22·3	4	3	...	...	3	436 Meal 92 Shorts	491 Meal 104 Shorts.	4 7¾	932	416	37

addition of bran to the food apparently caused a much greater loss on killing; (*d*) The addition of potatoes to barley decreased, and to maize slightly increased the loss on killing and dressing; (*e*) The addition of peas, beans, and oats respectively to maize also increased the loss on killing and dressing, whilst the addition of either peas or beans to barley diminished the loss; (*f*) The percentage of loss on the heavier pigs was less than that on the lighter ones fed on similar food.

The loss on killing and dressing depends chiefly on the age, or stage of development of the animal and the proportion of fat in it. The younger animal loses more as it contains a larger proportion of blood and viscera, and the fat animal loses less than the lean one in the same stage of development, and of the same live weight, on account of the smaller loss from fat compared with muscle or lean meat which is much more richly supplied with blood.

Maize contains a larger proportion of fat and a smaller percentage of albumenoids than barley, and therefore tends to yield fatter pigs. Separated milk is very rich in albumenoids and favours the production of lean, especially when the food to which it is added happens to be deficient in albumenoids. Peas, beans, bran, and, to a less extent, oats are richer in albumenoids than barley is.

On referring to column 9, we find that—(*a*) a larger proportion of best pigs for bacon was obtained with barley than with maize feeding, whether used singly or with similar additions of other foods; (*b*) the addition of either milk or bran, but especially the latter to barley, raised the proportion of best pigs for lean bacon; the addition of bran to maize produced a similar effect; (*c*) the addition of potatoes to barley slightly decreased the proportion of best pigs, whilst a similar addition to maize slightly increased it; (*d*) the addition of beans to either barley or maize increased the proportion of best pigs, more especially in the latter case; (*e*) the largest proportion of best pigs was obtained with a diet of barley and bran.

Columns 10 and 11. (Food required for 100 lbs. increase in live and dressed weight respectively). In this report the remarks on these columns refer for the most part to those experiments which have been tried at least twice. Too much importance should not be attached to results obtained from a single experiment.

Column 10.—The chief points to be noted here are—(*a*) To produce 100 lbs. increase in live weight about 13 per cent. more maize than barley was required; (*b*) When fed with barley, 53·4 gallons of separated milk replaced 146 lbs. of barley, or 1 gallon of separated milk = $2\frac{3}{4}$ lbs. of barley; (*c*) When fed with maize, 59·6 gallons of separated milk replaced 186·7 lbs. of maize, or 1 gallon of separated milk = 3 lbs. of maize (*N.B.*—Fresh separated milk gave a better result than stale separated milk); (*d*) When bran was fed with barley, 143·9 lbs. of bran replaced 149 lbs. of barley, or 1 lb. of bran = 1 lb. of barley nearly; (*e*) When bran was fed with maize, 155·8 lbs. of bran replaced 181·3 lbs. of maize, or 5 lbs. of bran = 6 lbs. of maize; (*f*) Where pea meal was fed with barley, 88 lbs. of pea meal replaced 115 lbs. of barley meal, or 1 lb. of pea meal = rather more than $1\frac{1}{4}$ lbs. of barley meal; (*g*) When pea meal was fed with maize, 102 lbs. of the former replaced 179 lbs. of the latter, or 1 lb. of peas = $1\frac{3}{4}$ lbs. of maize; (*h*) When bean meal was fed with barley, 104 lbs. of the former replaced 126 lbs. of the latter, or 1 lb. of bean meal = $1\frac{1}{4}$ lbs. of barley meal nearly; (*i*) When bean meal was fed with maize, 104 lbs. of the former replaced 181 lbs. of the latter, or 1 lb. of beans = $1\frac{3}{4}$ lbs. of maize nearly; (*j*) When potatoes were fed with barley, 259·5 lbs. of potatoes replaced 63 lbs. of barley, or 4 lbs. of potatoes = 1 lb. of barley nearly; (*k*) When potatoes were fed with maize, 327 lbs. of potatoes saved 87 lbs. of meal, or $3\frac{3}{4}$ lbs. of potatoes = 1 lb. of maize.

The fact that the foods richest in nitrogenous matter are more effective when added to maize than when added to barley is well illustrated in the above deductions from the table of results.

From column 11 (increase in dressed weight) it appears that—(*a*) To produce 100 lbs. dressed weight, the quantity of barley alone used was very slightly in excess of the maize meal alone; (*b*) 67 gallons of separated milk fed with barley effected a saving of 201 lbs. of the latter, or 1 gallon of separated milk = 3 lbs. of barley meal. Hence separated milk at 1d. per gallon was as cheap for this purpose as barley at £3, 2s. 3d. per ton; (*c*) 72 gallons of separated milk fed with maize meal replaced 205·2 lbs. of the latter, or 1 gallon of separated milk equals rather more than $2\frac{3}{4}$ lbs. of maize. It may be remarked that 1 gallon of separated milk at 1d. costs the same as $2\frac{3}{4}$ lbs. of maize meal at £3, 7s. 11d. per ton; (*d*) Where bran was fed with barley, 202·5 lbs. of bran replaced 172 lbs. of barley. In this case, therefore, the value of the bran in increasing dressed weight was very considerably less than that of the barley. It should perhaps be mentioned however, in favour of the former, that a much larger proportion of the pigs fed on barley and bran than of pigs fed on barley alone were placed in Scale A; (*e*) When bran was fed with maize, 186 lbs. of the latter were replaced by 191 lbs. of the former, *i.e.*, the two food stuffs were of nearly equal value in the production of dressed weight. It should be remarked, however, that of 20 pigs fed on maize alone, 9 only were placed in Scale A, whilst of 19 pigs which received bran in addition to maize, 15 were placed in Scale A; (*f*) When pea meal was fed with barley, 119 lbs. of the former effected a saving of 145 lbs. of the latter. Hence pea meal at £6, 1s. per ton would be as cheap for production of dressed weight as barley meal at £5 per ton; (*g*) Where pea meal was fed with maize, 130 lbs. of the former replaced 168 lbs. of the latter, or 13 lbs. of peas = 17 lbs. of maize. Hence peas at £5, 16s. 4d. per ton would be as cheap for the purpose immediately under consideration as maize meal at £4, 10s. per ton; (*h*) 138 lbs. of bean meal fed with barley saved 162 lbs. of the latter, or 6 lbs. of bean meal = 7 lbs. of barley meal. Hence bean meal at £5, 17s. 4d. per ton would be as cheap as barley meal at £5 per ton; (*i*) 129 lbs. of bean meal fed with maize effected a saving of 180 lbs. of the latter, or 7 lbs. of beans = 10 lbs. of maize nearly. Hence beans at £6, 5s. 7d. per ton would be as cheap as maize at £4, 10s. per ton in producing dressed weight; (*j*) The feeding of 326 lbs. of potatoes with barley meal reduced the required quantity of the latter by 103 lbs. Hence when barley was £5 per ton, the potatoes might be valued at £1, 11s. 3d. per ton, or 3s. 4d. per sack of 240 lbs.; (*k*) In the case of potatoes fed with maize, 400 lbs. of the former saved 71 lbs. of the latter. This gives the value of the potatoes in this diet as 16s. per ton, or 1s. 5d. per sack when maize is £4, 10s. per ton. The low value of potatoes when fed with maize compared with that when fed with barley is worthy of note.

In column 12, it will be seen that for production of weight of carcase only, *i.e.* irrespective of quality of meat and rapidity of increase in weight, the cheapest diets were :—

		s.	d.	
1	Maize meal, separated milk and potatoes	3	11	per score.
2	Maize meal and separated milk	4	2	,,
3	Barley and maize meals, and separated milk	4	$3\frac{1}{2}$	,,
4	Maize and Reckitt's meals, and separated milk	4	$5\frac{1}{4}$	,,
	Maize meal and bran	4	$5\frac{1}{4}$	,,
6	Barley meal and separated milk	4	$5\frac{3}{4}$	,,
7	Maize meal	4	$6\frac{3}{4}$	,,
8	Maize and pea meals	4	$7\frac{3}{4}$	,,
9	Barley meal, potatoes and separated milk	4	8	,,

Of course the order of the above diets would change with variations of the ratios of the prices of their ingredients. It may be observed that the average cost of producing a score dressed weight with the diets selected above was less than half the average price per score obtained for fat pigs.

In column 13 it will be seen that the diets which gave the best average quality of meat, for the production of lean bacon, arranged in order of merit are as follows :—

		Points.
1	Barley and wheat meals and separated milk	1000
2	Barley meal and separated milk	999
3	Barley meal and bran	998
4	Barley meal and beans	997
5	Barley meal and maize germs	992
6	Barley and pea meals	991
7	Maize and pea meals, and crushed oats	988
	Maize, pea, and bean meals	988

It is noteworthy that barley meal is the staple of the first six diets, and that the first four diets produced meat of practically the same quality.

The importance of the additions made to barley and maize meal respectively in the above diets may be appreciated by considering that the diet of barley alone received 984 points and one of maize alone 952 points.

Referring to column 14, estimated comparative value of foods, it may be well to repeat that the numbers in it are based on the assumption that the value of a food varies directly as the quality and quantity of increase in dressed weight produced in a given time. Confining our attention almost exclusively to those diets which have been tried at least twice, we may arrange them in the following order of merit :—

		Points.
1	Maize meal, potatoes, and separated milk	1000
2	Barley meal, potatoes, and separated milk	969
3	Barley meal and separated milk	943
4	Barley and maize meals, and separated milk	894
5	Maize meal and separated milk	892
6	Barley and bean meals	838
7	Barley and pea meal	808

For the purpose of illustration, it may be pointed out that, judged in the manner indicated above, the value of a diet of maize, potatoes, and separated milk, (1000) is rather more than double that of a diet of barley and bran (449), and more than half again as great as that of a diet of maize and beans (619). This disparity is chiefly due to the unequal rates at which these diets increase the dressed weight of a pig.

Referring to column 15, estimated comparative cost per unit value of diet, it should be again stated that an attempt is made here to show the relative cheapness of the diets, when their efficiency for fulfilling the object in view, viz., the rapid production of lean meat for bacon is given due consideration. Judged from the point of view here indicated the cheapest diets, arranged in order of merit were as follows :—

		Relative Cost
1	Maize meal, potatoes, and separated milk	13
2	Maize meal and separated milk	15
3	Barley meal and separated milk	16
	Barley meal, separated milk, and potatoes	16
	Barley and maize meals, and separated milk	16
6	Maize meal, Reckitt's meal, and separated milk	19
7	Barley and wheat meals, and separated milk	20
	Barley and pea meals	21
	Maize and pea meals, and crushed oats	21
	Maize, pea, and bean meals	21

In illustration of the great variation in the relative cost of diets for the rapid production of lean meat and of the importance of the additions made to the staple meals used for pig feeding, we may compare the cost per unit of barley alone (26) with that of barley and milk (16), and the cost per unit of maize alone (25) with that of maize, potatoes, and milk (13).

With reference to the all important question of profit on pig fattening, the relative cost of the diets employed for the purpose is a very important consideration, but it is by no means the only one. The difference between the cost of the store and the selling price of the fat pig per score, always a matter of great importance, becomes the chief factor when pigs are bought in at 5 or 6 score and fattened up to about 9 or 10 score, as they were for the purpose of the Calne experiments.

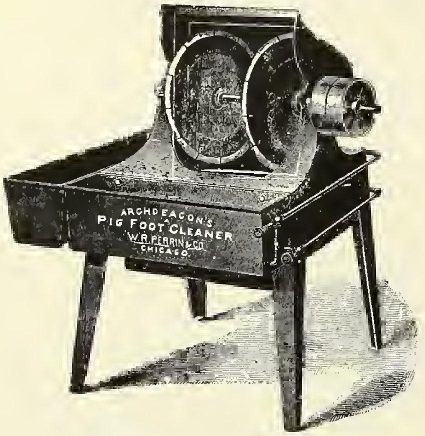
The pigs were not specially selected for breed, but were purchased in the manner customary with the great majority of farmers, and consequently although the results obtained with the various diets were, on that account, subject to a greater number of disturbing influences, yet they are more in accord with what might be reasonably expected by the average farmer, and may probably afford more reliable data for him. This remark is not intended to imply that the breed of pig is of but little importance ; on the contrary, in the production of first-class lean bacon it is quite as important a factor as the diet used for fattening. The proportion of lean is especially dependent on the breed, and can be effected only to a very limited extent by the nature of the food supplied during the few weeks of fattening.

Pig's Foot Cleaning and Cooking.—The handling of pig's feet so as to produce a profitable return requires scientific method and absolute cleanliness. The feet should be used fresh as cut from the pig ; the front feet are always used first as they are the best for turning into edible delicacies, and the hind feet contain more bone. The toes are pulled off, and the hair clean shaved ; the feet should then be well washed and scraped, taking care not to cut them as this causes them to break when cooking. In large factories the cleaning is done by an ingenious machine known as Archdeacon's Pig Foot Cleaner, and after cleaning, fresh water should be kept running on them until they are cooked.

The constantly changing of the water removes the blood and makes them more inviting and whiter when cooked.

In cooking pig's feet a wooden vat is preferable, which must always be kept scrupulously clean ; at the bottom of this vat a steam coil is fixed, and on top of same should be fixed a perforated hard wood false bottom. It is absolutely necessary to cook pig's feet slowly and to handle them with

care. Fill the vat half full of cold water, then put in the feet to within a foot of the water level, or about 18 inches from top of vat, and turn the steam on gradually. After the steam has been turned on for about ten minutes the thermometer should register 70° Fahr., in ten minutes more



Archdeacon's Pig's Foot Cleaner.

80°, and it should be kept heating gradually until it reaches 210°, after which the steam must be reduced so that no higher temperature is registered. In eighty minutes shut off the steam entirely, skim the surface of water, and then cover the vat and let it stand for six hours. The whole should be cooled down by running cold water through the pipes, and the grease can then be taken off in a clean mass—the process of cooling may be continued during the night so that on the following morning everything is quite cold. Take the feet out very carefully so as not to lacerate them.

Many very savoury dishes can be produced from pig's feet —such as boneless split pig's feet., etc. The former may be prepared by making a spiced liquor of allspice, pepper, and water well simmered for three hours, strained through a cloth, and poured over the boneless split feet. The spices themselves may be then placed over the whole pig's feet to give them an appetizing appearance. The proportions for making the spiced liquor are as follows :—

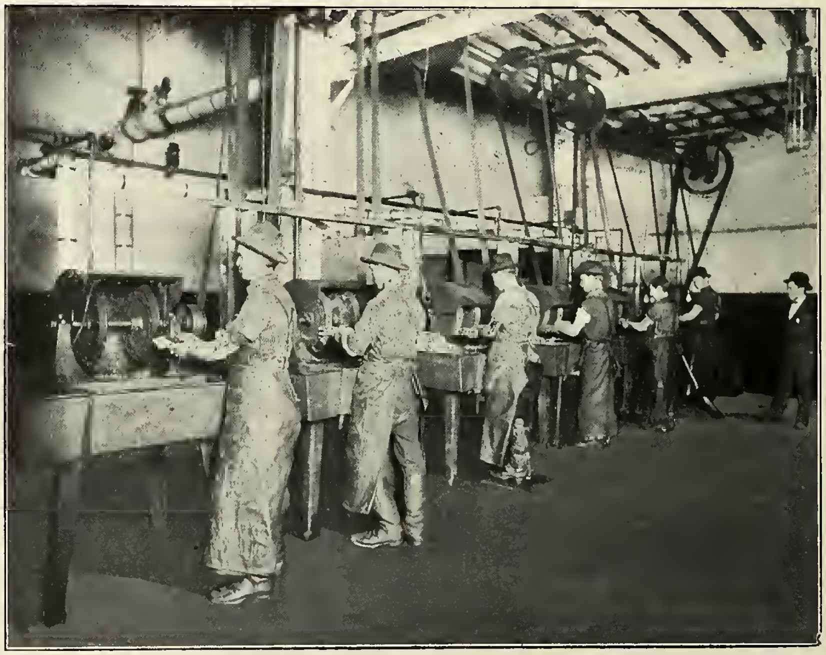
1 lb. whole pepper.
1 ,, whole pimento.
3 gallons water.

After the simmering add sufficient hot water to make up any loss in bulk.

The following full recipé for the preparing of boneless pig's feet is taken from "Archdeacon's Pig's Foot Manual," published at Indianopolis, Ind., U.S.A. :—

Before using the boned feet have them examined carefully so that they will be entirely free from bone and hair and well drained; if there are any dark pieces in (as there are sometimes) take them out.

Formula.—Take fifty pounds boneless pig's feet, one quart spiced liquor, one quart forty-five grain vinegar, and about two tablespoonfuls of salt; place them in a jacket or other kettle (not iron); a tin or tinned kettle is the best, as vinegar in a iron kettle will turn the meat dark; heat it gradually, and stir slowly; the glutin in the feet will mix with the other liquids and will thicken the whole mass. When it seems thoroughly heated and reaching the boiling point, pour it in gallon-size earthen milk crocks or other suitable vessels as desired. Care must be taken that it is thick enough to become solid when cool; if it is found not so, boil a little longer and add a little more boned meat and try it again. It may take several experiments to get the proper thickness. If you find there is not jelly enough without cooking the boneless feet too much (for it must be cooked very little or it will become mushy), make some jelly out of some forefeet, using very little water and boil slowly until thick enough. The longer you boil it the thicker it will be until the meat is all boiled away; or you can add a little more of the drained boneless feet until it is thick enough. Be careful and keep it well stirred while over the fire or heating. Another way to make extra jelly is by taking a portion of the water the feet are cooked in before letting on the cold water and boil it until it is thick. Keep this in your cooling room and use it instead of cooking the other too much, as too much cooking makes it look mushy and not presentable. If you find it too thin, instead of over cooking add more boneless feet until you get it right, stir well, bring to the boil and it is ready for the crock. Fill the crocks very full as it will shrink; the gallon crock when full holds 8 lbs. net of feet. After standing over night the meat will be firm in the morning. Turn a crock of the meat out to see if it is solid and looks well, cut it in pieces and see that it is all right; you can put these pieces in the next batch, cook it over and it will not hurt it. If you find the meat all right, cover with a dusting of white pepper and lay a piece of heavy dry paper over the pepper; take a piece of heavy manila paper, cut it round, about one inch too large for the crock, soak well on both sides with common flour paste, press it on edge of jar smoothly all around and let it stand and dry. If you want it fancy, buy thin tin foil and paste over the paper; when dry, paste on your label and it is ready for market.

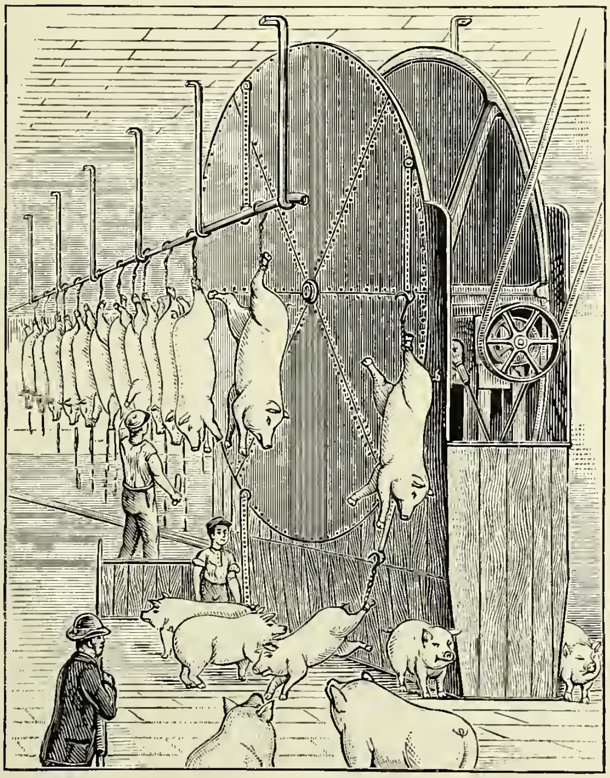


Archdeacon's Pig's Foot Cleaners at work at Indianopolis, U.S.A.

Vinegar.—The best vinegar for this use is pure white wine vinegar. In summer it should be forty-five grains, and in winter forty grains. If the vinegar is impure it will darken the goods and make them slimy; if pure it will whiten the goods and have a tendency to make them hard. Care should be taken to put clear, clean, limpid vinegar on your goods, or you can not turn out good goods. It is the most economical to buy ninety or one hundred-grain vinegar and reduce it as you need it. You should have a proper vinegar tester so you will not be deceived in the strength.

Pig Hoist (Rotary).—The best form of hoist for raising pigs to be slaughtered in the catching pen is rotary.

When a large number of pigs is to be dealt with, the most rapid means of raising them to the track bars is always desirable, inasmuch as it is in the catching and hoisting that much time is lost. The rotary hoist has wheels 12 feet



Rotary Pig Hoist.

in diameter, and can be made double if necessary (as illustrated). A heavy frame work, connected to a central axle, which is rotated by a spur wheel at the end of a shaft driven by a pulley from main shafting, is covered with steel sheets presenting an even surface.

The mode of operation is as follows:—

The pigs are shackled by loose leg chains, at the end of which are hooks. These hooks are caught up by rings which are at the end of short chains suspended from the circular frames, and which are hung from pins secured to the periphery. These chains are always in the vertical position, because the pin is kept well oiled. The wheels revolve at from two and a-half to three turns per minute, and hoist the pigs up so that they drop right on to the track bar, which is carried at from four to five inches from the face of the wheels.

The great advantage of this hoisting apparatus lies in the easy lift, so preventing any injury to hams or gammons, and also the great speed with which the work can be done.

Pig Products.—Utilisation of the different parts of the pig (from the French).

Fresh Pork.—Under the name of fresh pork is comprised generally, all the lean and fresh parts of the pig destined to be roasted or grilled, particularly the cutlets, the loin and the small fillet. The cutlets are usually separated one by one; very often they are not cut up, they are then called "carre de côtelettes" (literally chops cut into squares).

The loin, called also fillet, is the fleshy part between the cutlets and the ham. It furnishes an excellent roast. The fillet-mignon is the long and narrow fleshy part under the kidney along the dorsal spine. It is part of the loin. It is the most delicate morsel of pork and weighs from a half to a pound weight at the most and its price is relatively high.

Hams.—Nearly always entire hams are salted (cured), sometimes they are used for cooking after several days curing, sometimes for smoking or preserving a longer or shorter time. Sometimes they are boned and used for the manufacture of different kinds of sausages.

Shoulders.—Shoulders are used to make rolled or boned hams. Sometimes they are cured and smoked, and are then called fore hams. Most often they are used for small and large sausages.

Fresh Lard (Back Fat).—The fat between the skin and the flesh is called fresh lard or simply lard. There are two kinds: melting fat and hard fat. The first or that nearest the flesh is easily known by the touch. It yields to a slightly strong pressure of the fingers. It is used for the most part for the manufacture of lard, the other or hard fat adheres to the skin and is not easy to melt. It is used in the preparation of a great number of products used in the charcuterie* trade.

Kidney Fat.—"La Panne" is the fat that covers the kidneys and the fillet. It is used for fine forcemeats and in black puddings to which it gives a delicate taste. From this fat also is obtained a very fine and white lard called "axungia," superior to ordinary melted lard.

Epiploon (Skirting).—Epiploon, called also the kell or caul is used for wrapping round different stuffed pieces, such as truffled feet, stuffed cutlets, flat sausages and broiled livers.

Gut Fat.—The ratis, rigon, or rouage is the fat that adheres to the intestines. If melted alone, lard of second quality is produced; often it is melted with other lard so as to make lard of an ordinary quality.

Lungs, Liver, Heart, Kidneys, Brain and Spleen.—The lungs and liver form some of the ingredients of various kinds of sausages, liver pâtés and grilled liver. They can be prepared by the culinary processes which are used for other similar pieces of butchers' meat. The spleen is not a very delicate morsel, it is used generally in sausages of an inferior quality.

Intestines, Stomach.—The intestines or intestinal canal, comprise the small intestines, the coecum, the colon and the rectum. The small intestine which the pork butcher calls "menu" or menuises, is used to pack up different kinds of sausages and black puddings.

* The word charcuterie is the name given to the trade in France which we would call pork butchering, but the charcutier is an accomplished chef as a rule who prepares all kinds of fancy small goods such as galantines and others practically unknown out of France.

The coecum, called bag or pocket, is used, as also the colon (chaudins) and the rectum and fat end for the packing of different sausages to keep, and for the making of stuffed chitterlings. The stomach or paunch requires long cooking, after which it is used in common sausages and chitterlings.

Tongue, Ears, Snout, Feet, Hams, and Tail.—All these different pieces can be cooked alone, or with vegetables, without any special preparation being necessary. Very often they are put for some days into a brine—they are then called "pickled pork." The tongue, ears, and snout are used also for heads and collared brawn; the tongue can also be used for converting into savoury tongue. The feet are used in the making of jellies and other confections.

Skin, Rind.—The skin of the pig can be easily tanned. It furnishes a leather of much greater solidity, and which advantageously replaces that of the ox. It is not now customary to skin the pig when slaughtering. The animal is now either scalded or singed, and the skin is eatable, and is called "rind." Slightly salted and cooked with vegetables, or in broth, the skin makes an excellent dish. It forms an important element in the making of jellies, to which it gives a good consistency. Skin left on salt meat preserves it from insects, and from the effects produced by the air.

Blood.—The blood of the pig is very valuable for the manufacture of black puddings. It is used in cooking to thicken sauces, and it clarifies jellies and gives them a beautiful golden tint.

Hair.—The hairs or bristles are used extensively in brush making. The bristles on the back serve as needles for boot and shoe manufacturers, and when care has been taken to pull them out before scalding they are very valuable indeed.

Bones.—The bones, fresh or salted, are used in the making of soups or jellies. Care should be taken to break them, so as to allow of the juices, and of the marrow contained in them, coming out. After being cooked, the bones can be pulverised and used for manure.

Hoofs.—Pulverised hoofs make a very rich manure. They are also used in the manufacture of glue and Prussian blue.

Bladders.—The bladders, after being well washed, blown, and dried, are used for wrapping round sausages, and particularly for packets of lard for keeping. Bladders are also used for hermetically sealing pots of preserves.

Gall.—The liquid contained in the gall bladder is very good for taking out grease stains without taking out the colour even of the most delicate stuffs.

Curing, and taking out of Cure (*Curing*).—Curing is one of the oldest methods known for the preservation of meat. It is at the same time the most practicable and the least costly. There is an objection against it that it takes away some of the properties of nutrition. This objection has a foundation, but it applies, unfortunately, to all the other methods of preserving foods in use up till now.

Curing is not only a means of preserving the meat, it is also a preparation and seasoning by which are obtained special products which have indeed their value. Hams and bacon constitute nutriments which play a great part in the food supply, and which the same meats in the fresh state could never replace.

To assure success in curing, one must—(1) Commence with the twenty-four hours following upon slaughtering; (2) Choose meats which are free from bruises, and which have been taken from healthy rested animals. Work in an airy place, cool and dry, and only during the favourable season, which lasts from the end of October to the end of March. There are two principal processes for salting meats—the wet process and the dry. Both have their merits, and their combined use offers advantages.

The Wet Process.—The wet process consists in steeping the meats in a brine for some time, according to the thickness of the pieces of meat. This process is carried out throughout Germany, Belgium, Italy, Switzerland, and in parts of France and England, and in the different States of America, where the system of curing has reached a perfect state. Further on will be found some information necessary for the preparation of brine, and for regulating the time of immersion.

Dry Curing.— Place the meats on the salting table. Powder them with fine saltpetre, rub them vigorously with the hand on all sides so as to make the saltpetre penetrate well into the meat. Rub afterwards with sea salt pounded fine. Arrange them one beside the other, in such a way that they will not get out of shape, then cover evenly with a good layer of white salt. This operation is renewed every two or three days, until the salt has well soaked into the inside of the flesh—a result which is obtained in from one to four weeks according to the size of the pieces. The process of dry salting is carried on in different parts of France, Italy, America, and generally in places where salting is done for export.

By the liquid salting process the necessary salt flavour is obtained, inasmuch as they are immersed in a brine more or less salted. With the dry process on the contrary, the meats coming into immediate contact with the salt are impregnated too strongly. This difference in result is easily explained through the action of the salt; in both methods this condiment clears out the aqueous portions of the blood in the tissues and thus preserves the meat from taint. With dry salting it is pure salt which saturates the meats; in the wet process the brine which acts like salt, being a solution of it, impregnates in a much less degree the flesh as it is so much weaker being in solution.

If the wet salt process is used, nothing must be done until after the meats are thoroughly chilled, which is not often complete (according to temperature) before twelve to eighteen hours. If this precaution is neglected, and the warm meats were heaped into a brine tub, not only would they become unshapely, but they would become hot and ferment, the inevitable consequence of which would be their corruption and that of the brine.

With the dry process, the meats can be salted immediately after slaughter, which is favourable to the success of the operation. In fact it is known that by reason of its chemical composition, meat tends to decomposition as soon as the animal ceases to live, and it is therefore apparent that the less advanced is this tainting, the greater is the success of the salting.

The hardening of the flesh which is not completed until about forty-eight hours after slaughter, is done under the best conditions while the dry salting is going on. The repeated rubbing necessitated by this method has the

advantage of drawing out the remaining blood in the pores of the animal; moreover the salting is done quicker, consequently more surely.

The excess of saltness in taste given to the meats can be modified by mixing with the salt a certain quantity of sugar. This corrects the harshness of the salt, replaces to some extent the loss of the juices of the meat which it renders more digestible, more tender, and better coloured. This mixture has no other disadvantage than its relatively high price. In many cases the two processes should be concurrently employed; the meats are dry salted for from two to four days, and the curing is then finished in brine. This combination is excellent. It enables the curer to secure the advantages of both methods.

Mixed Curing.—In some countries after rubbing the meat with saltpetre or salt, it is placed in a salting tub, surrounded with salt and heavily weighted. After some days a brine is formed which covers the meat, which is allowed to soak until the end of the salting process. Without having the advantages of the processes of which we have just been speaking, this system of salting possesses inconveniences, and therefore is not to be recommended.

The Martin de Lignac Process of Salting.—We give a method by which the work is well and quickly done, which was invented by Martin de Lignac as far back as 1862. Into the interior of the piece of meat a kind of hollow borer (needle) is introduced, provided with a cock, one of the ends of which is joined by a pipe to a tank, placed at a height of about 25 to 30 feet. The tank being full of brine, the cock is opened, this liquid is immediately precipitated between the muscles and goes into the cellular tissues. This done, the meat is put in brine for from two to four days, and afterwards it is dried and smoked as usual.

Salting by Brine or Pickle Pump.—Martin de Lignac's apparatus has been replaced by the brine or pickle pump which fulfils exactly the same purpose. There is an objection to it which applied also to the system of M. de Lignac. It is always a disadvantage to be obliged to pierce holes, however slight, in the meat to be preserved. The air gets in and taints the parts with which it comes in contact. But for curing meats which are not to be kept more than two months, the pickle pump is a real advantage, we will see that for summer curings, the pickle pump is of great assistance.

Summer Curings.—We have seen that the best season for curing commences at the end of October, and is continued till the end of March. However, this time only strictly applies to meats which are intended for keeping. Those that are to be delivered for immediate consumption can be cured at all seasons, provided that the work be done in an open, airy place, and that the operation is conducted with celerity. For the rest, all depends on the climatic situation; in the South, salting cannot be done in the summer time; while, in the North, it can be done at any time of the year.

By means of the brine pump, strong brine is injected into the pieces of meat, and they are then steeped in a good brine from two to six days—this brine being cooled with ice enclosed in cylinders. When the temperature is very high, the brine is replaced by a mixture of salt and small pieces of ice placed round the meat, which are renewed in proportion as they melt.

Brine.—The name of brine is given either to the liquid that comes out of the meats submitted to the dry-salting process, or to a solution of salt in water. It is this latter with which we shall deal.

For the preparation of brine, white salt is preferable to grey—however, a small quantity of the latter is useful, because it adds a little magnesia and lime, which preserve the nutritive qualities in the meats. A small quantity of saltpetre is also necessary. It gives a colour to the meat, which almost approaches its natural colour, and the potash which it contains neutralises a little the strength of the extraction of the salt. Sugar is also indispensable in the preparation of a good brine. It renders the meat tender and digestive, and replaces some of the juices eliminated by the salt. Different essences are used to flavour the brine. These are:—juniper berries, bay leaves, corianders, cumin, sage, cloves, cinnamon, thyme, basil, marjoram, balm-mint, savory, rosemary, and peppercorns. It is necessary to use these with moderation, because, if used to excess, they hide the flavour of the meat. To flavour the brine they are infused in a small quantity of boiling water This is kept covered until cool, and it is then poured into the brine. In preparing the brine, the water, salt, saltpetre and sugar should be boiled together for some minutes, so as to expel any impurities which they contain, otherwise these cause the meat to become tainted.

Brine well looked after may last several years, but it should not be used more than one season, because, after longer usage, it often contracts a certain bitterness which is communicated to the meats. Each time that new meat is put into the brine, it is necessary to strengthen it by the addition of a little salt or new brine; but if the meats to be put in have already been dry-salted, this addition is not necessary, as they already contain salt. In order that their brine should last a longer time, or to stop fermentation, some pork butchers boil it up again. Any old brine, or any which has become slightly tainted, should be at once replaced.

It is to be observed that the ingredients given below are for winter curings. For summer, the brine must contain more salt; for salting young and delicate pieces of meat, a brine with not much salt is to be chosen.

Different ways of preparing brine.

No. 1. Put into a boiler and let boil for ten minutes, taking care to stir during cooking.

6 gallons of water.
21 lbs. of white salt.
2 ,, ,, grey salt.
6 ,, ,, sugar.
2 ,, ,, saltpetre.

Empty out the brine and all that may remain of the condiments, undissolved, let it get quite cold and then add: a flavouring made up of ¼ of a pound of spices acording to taste; pour over the meat rubbed with saltpetre and salt. This brine is excellent and can be used for all kinds of meats, and notably for all meats where special brines are not indicated. This quantity suffices fully to pickle all parts of a good sized pig.

No. 2. Boil as above.

5 gallons of water.
8 lbs. of white salt.
2 ,, ,, grey salt.
$2\frac{1}{2}$,, ,, sugar.
$2\frac{1}{2}$,, ,, saltpetre.

allow to cool; flavour with $\frac{1}{4}$ lb. of spices.

No. 3. Boil and cool as with above.

10 gallons of water
50 lbs. of white salt.
4 ,, ,, grey salt.
$4\frac{1}{2}$,, ,, saltpetre.
5 ,, ,, sugar.

add a flavouring of $\frac{1}{2}$ lb. of spices.

No. 4. Boil for several minutes: 3 gallons of water, in which dissolve $\frac{1}{4}$ lb. of saltpetre. Use this brine for steeping delicate meats in which have been previously rubbed and covered with salt.

No. 5. Liebig recommends the following recipé:—Dissolve in 11 gallons of cold water: 36 lbs. of white salt, $\frac{1}{4}$ lb. of carbonate of soda. Stir to facilitate the dissolving, and then allow to stand. Draw off and pour over the meat. When marine salt is used, the quantity of soda used must amount to $\frac{1}{2}$ a lb.

No. 6. In some Italian provinces an excellent brine is prepared, composed of:—

$1\frac{1}{4}$ gallons of Barolo wine.
$1\frac{1}{4}$,, ,, cold water.
8 lbs. of white salt.
$\frac{1}{2}$,, ,, grey salt.
$\frac{1}{4}$,, ,, saltpetre.

flavoured with thyme, laurel, basil, savory, and juniper.

No. 7. In Westphalia the hams are pickled with a brine made with:—

$2\frac{1}{2}$ gallons of water.
8 lbs. of salt.
2 ,, ,, sugar.
$\frac{1}{2}$,, ,, saltpetre.
$\frac{1}{8}$,, ,, of spices, enclosed in a small bag.

The whole is boiled for about half-an-hour; it is then allowed to cool, and drawn off.

No. 8. For Bayonne hams, the following brine is used:—

$1\frac{1}{4}$ gallons of good red wine.
$1\frac{1}{4}$,, ,, cold water.
8 lbs. of white salt.
2 ,, ,, grey salt.
$\frac{1}{8}$,, ,, saltpetre.

and a flavouring of sage, rosemary, and lavendar.

No. 9. Many pork butchers prepare their brines in a way as simple as it is defective. They are content to dissolve a certain quantity of salt and saltpetre in cold water. This brine does not preserve, and must not be used for delicate meats.

Pickling Hams.—All the conditions specified for the success of pickling, must be rigorously applied for the pickling of hams. The greatest care must be taken in the choice of pieces to be submitted to this operation, and all bruised hams, or hams coming from a pig showing symptons of fatigue or heating must be rejected.

The Wet Ham Pickle Process.—Trim the hams, give them a round form, cut with a saw the half of the lower end of the spine, the projecting part, cutting it slantingly from the side of the pope's eye bone. Beat the hams with a mallet so as to draw out all the remaining blood in the inside. Pickle according to the dry process for 3 to 4 days—that is to say—rub the hams with saltpetre or, better still, with a mixture of salt and 10 per cent. sugar.

Place the hams on a salting table, cover them with a good layer of pure salt, or a little sugar may be added in the quantity above mentioned. After two days, again well rub the hams and cover them in the same way. On the third or fourth day take off the salt, rub again and put them in brine No. 1: three weeks for the large hams and two weeks for the small. In order to keep the hams in this brine, place on top of them a cover with an opening, and weight same with a heavy weight. The pickling finished, drain the hams and soak them for two hours in a large quantity of fresh water; wash them by means of a brush, then hang up in an airy place and allow them to dry for a fortnight. Smoke in cold smoke. Hams pickled in this way can be kept perfectly well without it being necessary to smoke them. In this case it is better not to wash them.

Dry Pickling of Hams.—In some countries the hams are treated for three or four weeks by the dry salting process alone, after which they are washed and smoked as above. As I have said, when a sufficient quantity of sugar (minimum 10 per cent.) is mixed with the salt, the results are very good, but when pure salt is used the hams become too salt and hard.

Pickling of Westphalia Hams.—Salt them dry: for four or five days with white salt; then steep for three weeks in a special pickle for these hams (No. 7). Finish the same as for the others.

Pickling of Bayonne Hams.—Salt dry, and put them at the same time in a press for eight days; cover then with a brine (No. 8) for twelve days. Drain the hams, hang them in an airy place; when well dry, wrap them in hay, and cold smoke with aromatic plants, such as juniper, etc.

In taking the hams out of the smoke stove, take off the hay with which they are enveloped; coat them over with a mixture of brandy and ashes, or with the dregs of wine, and hang them in a fresh airy place. This coating may be applied successfully to all hams, it prevents rancidity, and is a protection against insects.

Pickling of Rolled Hams.—Choose hams which are not very fat. Take away the knuckle bone, separating it at the joint; take out the marrow bone; leave the thin pope's nose; trim the rest. Pickle in brine for a fortnight; wash in fresh water for an hour or two, brush the hams, beat with a mallet so as to make them round and uniform. Tie with string, dry them in the air and smoke. When these hams are dry they can be served raw, but usually they are served cooked.

Pickling of Shoulders or Fore-hams.—Trim the shoulders, cut them round, pickle them dry, for three days; put them in brine for ten to twelve days. Dip in cold water, brush them and finish like ordinary hams.

Pickling of Rolled Shoulders.—Leave the knuckle bone of the shoulders, bone the rest with care, put in brine for twelve days. Wash the shoulders in water, beat them, roll them and tie them, making them into a nice shape. Let them dry and smoke.

Pickling of Beef.—Bone a piece of beef, a quarter, a fore-quarter, or a neck, cut up into square pieces of 8 or 10 lbs. Trim all these pieces, rub them with saltpetre, salt, sugar; place in a good brine well flavoured, but not much salt (No. 2), let them soak for a fortnight. After that the beef is ready for cooking; it can also be smoked. In this case it is washed and let dry a little before putting into the smoke stove.

Pickling Ox Tongues.—Take away the dead flesh, the gristle, and the fat which is found in the thick part of the tongue. Make on each side of this part slight incisions to facilitate the action of the salt. Wash the tongues in fresh water, brush them well, and dry them with a white towel. Rub them with saltpetre, then with a mixture of salt and sugar, and put them in a good brine for twelve days. The tongues can be kept for some time in this brine, or in the open air, or they can be cooked directly after pickling, or smoked. In this latter case they are washed, dried, and smoked cold, with aromatic plants. Before putting them into the smoke stove they can be stuffed in a goldbeater's skin that is firmly attached at each end, and which is again put in boiling water.

Ox tongues, like those of pigs, calves, and sheep, have on their thick side a slimy liquid, which easily taints the brine. This is why it is important to wash them well and dry them before putting them into the brine tub. For the same reason tongues should always be pickled alone in a special brine vat in which only the necessary quantity of brine should be put. When fresh tongues have to be pickled in brine which has already been used for this purpose, it must be seen that the brine is perfectly good.

Pickling of Ox Tongues during Summer.—In summer the pickling of tongues by the ordinary process is only successful in cold countries. The following method of pickling can be carried out at all seasons, and under all climates:—

Trim the tongues, whiten them; that is to say—cook them in water until the skin can be easily taken off—leave this skin and cool the tongues. Sprinkle them with saltpetre, rub them, place them for a week in a very strong brine, or in a mixture of salt and sugar, after which the tongues are ready for cooking or smoking. If they are not to be used directly after pickling, proceed as follows for preserving them:—Wash the tongues, dry them carefully, and place them in a tub at the bottom of which has been placed previously a screen, so as to leave an empty space in which any water the tongues may contain will be deposited. Cover the tongues with lard, which is still liquid, but cold.

Pickling Tongues of Pigs.—Prepare them the same as ox tongues. Pickle only for five days, and finish like the preceding. When the tongues are to be smoked, stuff them in ox gut.

Pickling Veal Tongues.—Same as for pork.

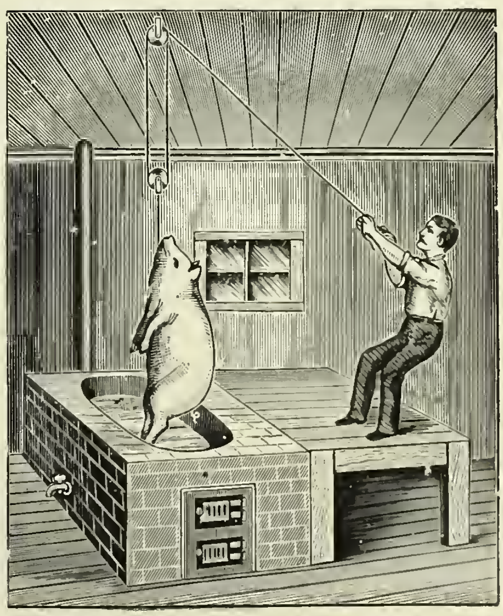
Pickling Briskets.—Trim the briskets to a square; salt them dry for four days, then put in brine for a fortnight. The pickling finished, soak the briskets in fresh water for an hour, brush them. By the aid of a packing needle, pass a strong thread between the second and third ribs, passing right through the fat from one side to the other; make a ring, and suspend each brisket in a fresh and airy place. As soon as they are a little dry, smoke them without heating. In some countries it is usual to take away the ribs before pickling, when it is to be preserved. This is a bad practice, as the fat is apt to become rancid.

Salting of Breasts of Pickled Pork.—Breasts of pickled pork undergo the same operation as the above, but are kept a shorter time in salt; two or three days dry salting, and the same for the wet process suffice. They do not keep long, and ought to be prepared in proportion to the demand.

Pig Scalding Tanks.—The scalding of pigs is a very essential part of their treatment in their preparation for either fresh pork or for bacon. Porkers and pigs to be used for sausage making, are scalded only, but pigs for bacon

Pig Scalding Tank for Pork Butchers.
5 ft. 4 in. by 2 ft. 6 in. by 2 ft. Capacity about 150 Gallons.

are treated differently. In Ireland they are scalded first then singed; in Wiltshire they are singed only and not scalded. Why there should be this difference it is difficult



Pork Butchers' Pig Scalding Tank, with Fire Place and Brick Setting, also Scuttling Table.

to say. Denmark has followed the lead of Ireland, in scalding the pigs before singeing. In the United States, also, a similar practice is followed.

The scalding tanks in use in bacon factories are rectangular in shape, and a fair size is 8 ft. long by 5 ft. wide by 2 ft. 6 in. deep. Water is let into this tank, and heated by steam to 140° or 150° F., according to the size of the pigs to be scalded. Porkers and small pigs are easily scalded, hence they are treated at the low temperature. Large pigs have the hair more firmly fixed in the skin, and, therefore, are scalded at the higher temperature. In any case, the carcases are not taken out until the hair comes away in the hand, and, until that occurs, they are turned round about in the water. When ready to be removed, they are rolled on to the "cradle," and, by simply pressing down the lever, they are tilted out on to the scuttling table.

This "cradle" is a simple frame work of iron bars attached to a bar traversing the one end of the scalding tank. This bar is fixed in either side, and on one side is a projecting piece to which the lever is attached.

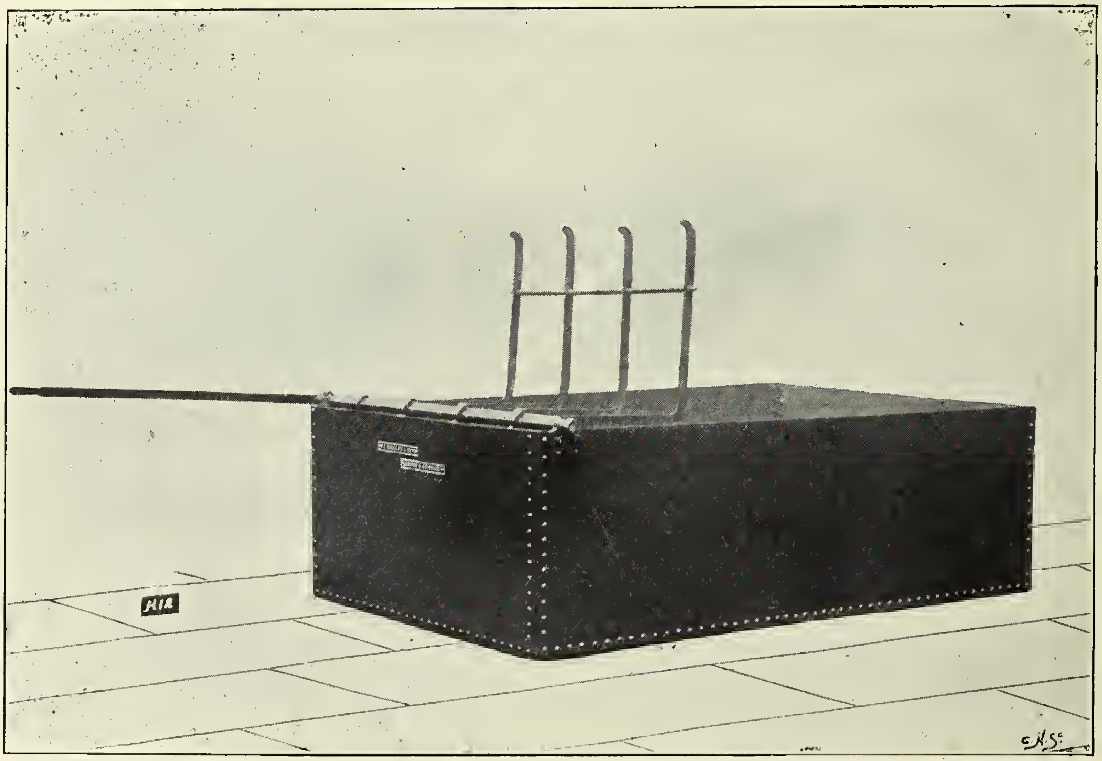
The pork butcher, also, has his own special form of scalding tank. This is oval, and rounded at the bottom. It only holds one pig at a time, and is heated by fire. The same temperatures are observed as in dealing with pigs in a bacon factory.

Pig Scrapers.—These are used by all pork butchers, bacon curers, and whoever handles pigs. Scrapers are made in a variety of patterns. Hand scrapers, such as the No. 10 and Bell patterns, are used for removing the hair from pigs after the carcases have been scalded. These scrapers are used when the carcases are lying on the scuttling table on their sides. The Flat scraper is used when the carcases are suspended from the track bars, and after they have been singed. The hair is reduced by the singer to a black coating on the skins of the pigs. There is also dirt and soot from the furnace deposited there. A current of cold water is turned on to the pigs, and, at the same time, the Flat scraper is used to remove the black deposit, which can be done with great rapidity.

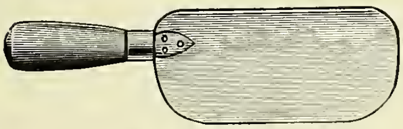
In America very generally, and in some places in Europe, are fitted scraping machines. These are meant for people who handle very large numbers of pigs, and who wish to do so rapidly. The machine is of very simple design, and does its work well.

The method is as follows :—The pigs, after being scalded, are attached by the gob or the apex of the lower jaw to a chain hook, which is twice attached to a moving, endless chain which completes a turn from one end to the other of the table shown in illustration, passing round a sprockett wheel at either end and along the under side. In the centre of the table is a frame to which are attached a number of arms, which are concentric, and terminate in the centre into a rounded knife, at right angles to the table. These arms and knives overlap.

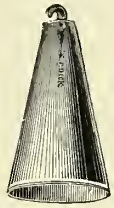
The pigs are dragged through the centre of these knives, and the arms, each of which has a spring attached, are pressed outwards so as to permit of the pig passing, which it does in the horizontal position. The knives therefore press all over the carcase, and so remove the hair, which drops to a large receiving tank beneath. While the pigs are passing through, a constant flow of water is kept up over



Scalding Tank for Bacon Factories.



Flat Pig Scraper.

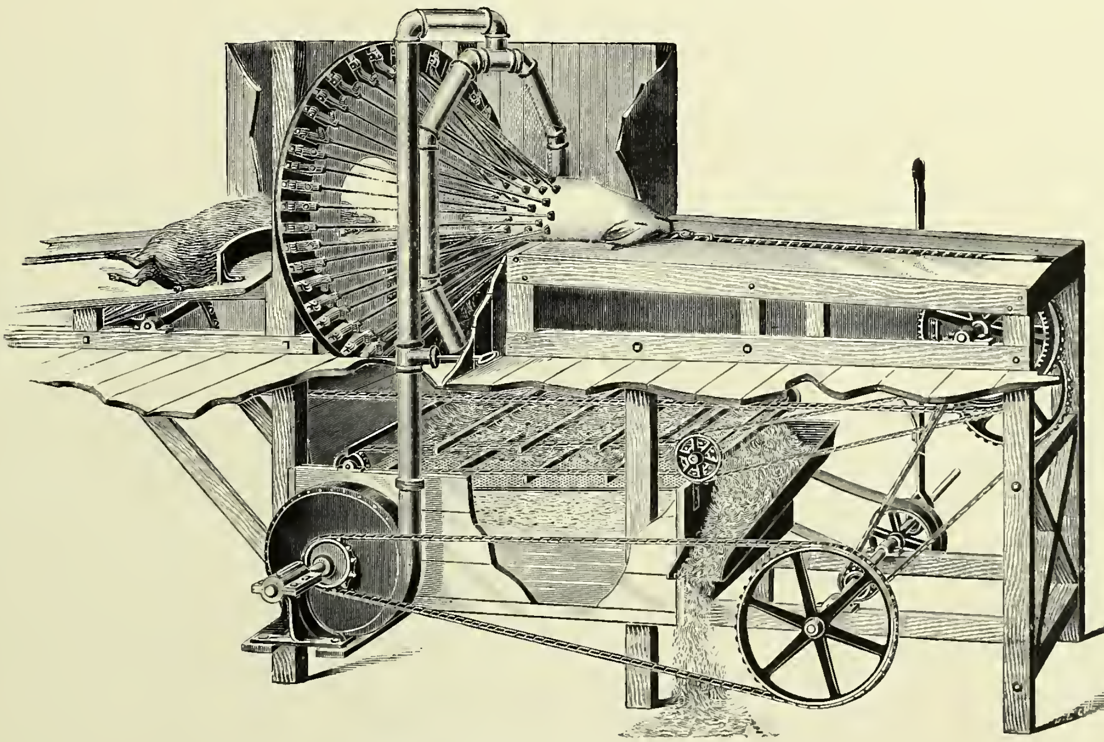


German Conical Scraper.

No. 10.
Pig Scraper.

Bell Pig Scraper.

pushed into a "bleeding passage" where all the blood runs out. This process takes about twenty seconds for each pig. When the blood has run out, the carcases are then thrown on to a "dumping table" and immediately rolled into a scalding tank. This scalding tank is three parts full of water, and is kept at a temperature of 140° F. (48° R.) to 150° F. (52° R.) according to the size of the pigs; when the bristles can easily be removed by the hand. The pigs are then tilted by means of a "cradle" on to the "scuttling table" of the scraping machine. On this scuttling table is an endless chain to which is attached a hook, the other end of this hook being inserted in the lower jaw of the pig. By means of machinery this chain travels round the whole of the scraping machine, and drags the pig through a series of little knives, which are fixed on a circular disc. These knives are fixed by means of adjustable springs, and, as the pig is dragged through the centre, they expand to allow of its passage; but, in the process of travelling, they remove the whole of the hair, which immediately falls into a receiver beneath. This receiver is also a water tank, and has a perforated diaphragm in the centre, upon which the hair is



Pig Scraping Machine—Capacity 8 Pigs per minute.

them, this water being circulated round by means of a circulating pump. The power required to drive the machine and the pump amount to about 24 B.H.P.

Pig Scraping Machine.—Where a large number of pigs have to be handled it facilitates the work greatly to have the scraping or removal of the bristles conducted by a scraping machine. Such a machine as we publish here, is at work in many places in Europe and America. The process is as follows:—

The pigs are caught in the catching pen and hoisted up by one of the hind legs to an overhead bar and when in this vertical position they are at once dispatched, and are

caught and mechanically thrust outside. The water tank supplies the washing water, which is pumped by means of a rotary pump from the tank, and is discharged on to the knives and the pig as it passes through the knives. The rate of speed at which the pigs may be scraped is eight per minute, and they are scraped entirely free from hair or bristles in every part. It is obvious from the structure of these knives, and the fact that they are attached to adjustable springs, that they will fit themselves into the form of the pigs without very much trouble.

Pig Singeing.—The various methods of singeing the bristles or hair from pigs which are intended for bacon have

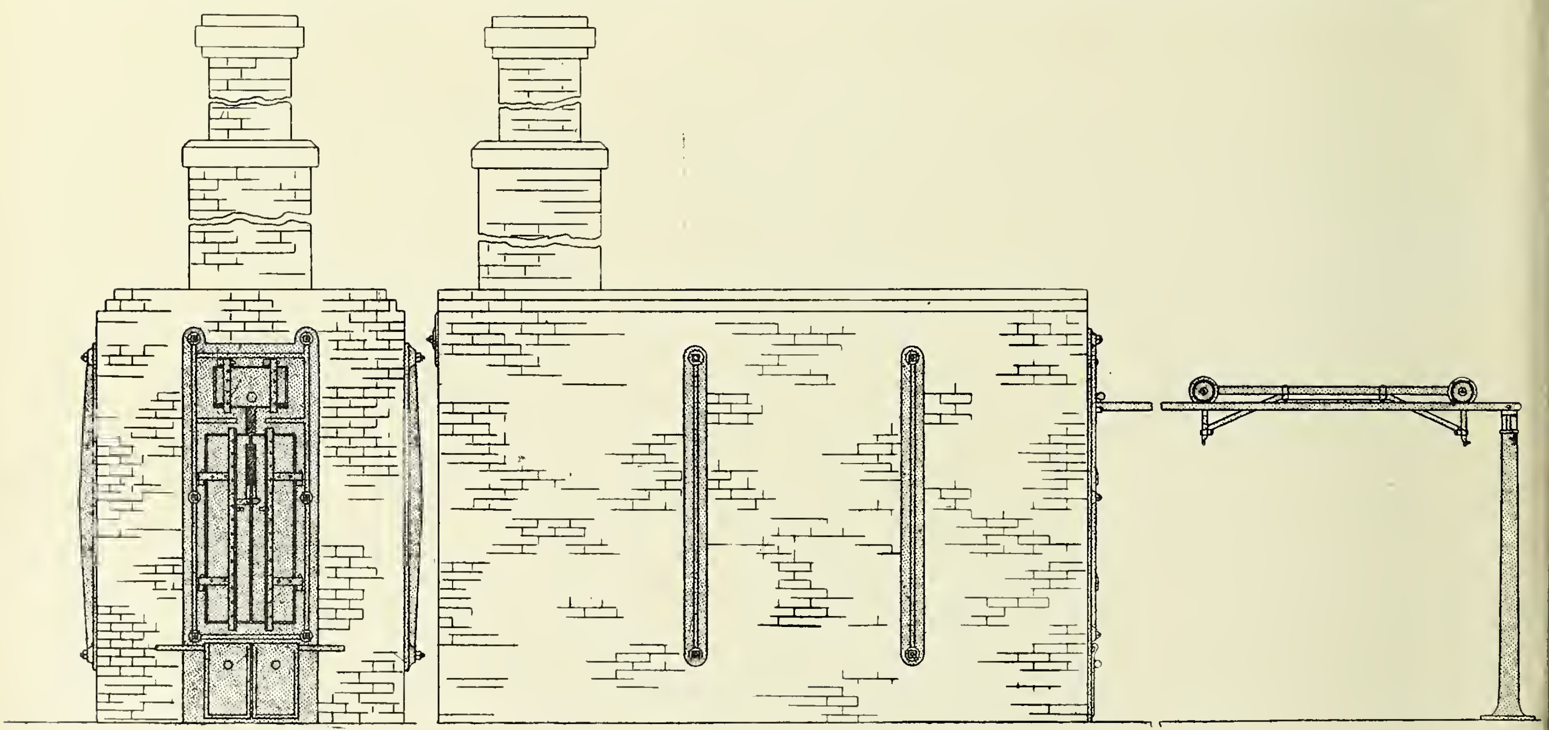
for their object the same end in view. The singeing is not primarily designed with a view to remove the hair but with a view to turning the skin and so hardening it, and at the same time hardening the fat immediately beneath the skin. It is also said that the flavour of the meat is improved by the singeing, though this is doubtful. The primitive way to singe pigs was to lay them, after they were properly bled, on beds of wheat or barley straw, and cover them up with the same material, then set fire to it and allow it to burn to ashes surrounding the carcases of the pigs. Even at the present day this primitive and dangerous custom is carried out, and in no less a place than the abattoirs of la Villete, Paris, it may be witnessed several days a week !

Pig singeing apparatus is universal amongst bacon factories whether they are small or large, and it has also its varieties. Small factories and factories where producer gas is made have found the "shield" or "saddle-back" furnace useful. It is simply a semi-circular shield made of double iron plates with a space between them. The inside plate has a number of gas jets projecting from it, and air is provided by means of a fan. Gas is used and is, as indicated, mixed with air by means of a fan which forces the mixture through the jets and so against the suspended pigs, one at a time. By means of a pulley the apparatus is raised or lowered so as to singe all portions of the carcase. For small factories there is also a coal furnace worked on the horizontal principle.

The principle of this furnace is very simple. The pigs are attached to the carriage on railway and pushed through the door ; instantly the flame reaches every part at the same time, and thus unequal singeing is avoided. One pig at a time is singed. In about half-a-minute the pig is withdrawn, and by means of a revolving table (not shown in drawing) may be at once plunged into cold water or may be elevated to the overhead rail and cold water poured over it, after which it is scraped. On this same design there have been larger furnaces built with a revolving carriage, with four arms to which four pigs are attached, and the work got through in less time where there are a large number to be handled. These furnaces are of larger dimensions than the other in every way, but their use is being discontinued owing to the heavy charges for repairs involved and the cost of fuel.

In Denmark there is another form of furnace in use which, however, is open to the same objections as the horizontal furnaces. The Wendlebo-Madsen furnace has been adopted in a good many Danish bacon factories.

The patentee describes the furnace thus :—"The great advantage in connection with the use of this singeing furnace consists in the absolutely even and uniform singeing of the pigs. By means of a self-braking lowering apparatus the animal may be allowed to pass at a quicker or slower speed through the flames that are projecting into the furnace from two fireplaces, one on each side of the furnace, whilst the progress of the singeing may be witnessed through a peep-hole in the door. Owing to the existence of the water tank and the sudden cooling the rind gets much nicer than is usually the case, and the black mass that accumulates on the rind during the singeing may be removed with greater facility and speed than formerly. On account of its cylindrical shape and the heavy iron stays the furnace is a very durable one, whereby the expensive repairs in connection with other furnaces are avoided. The inner wall of the furnace is made only of large unhewn stones. The furnace is very easily attended to, and the pigs are conveyed very easily from the scraping table to the slide bar, being



Front View. Side View of Furnace shewing side view of Sliding Railway.

Pig Singeing Furnace for small Factories. Heated by Coal or Coke.

suspended by hooks introduced in their lower jaws. At the bottom of the tank is arranged an outlet valve for letting off the water after the singeing has been completed."

Large sized Horizontal Pig Singeing Furnace at work.

The process of singeing is as follows :—After the pigs are bled they are scalded and partially scraped. A "gob hook" is then placed in the apex of lower jaw and the carcase is pushed along a track bar which passes through an iron door in the side of the furnace and terminates in the centre. The flames meanwhile envelope the carcase, and when it has been subjected to their influence for a quarter of a minute the carcase is *pushed* off the rail by means of a hand fork and drops into a bath of water, from whence it is picked up on to the track bar and cleaned in the usual way by means of a flat scraper. Sprinklers are placed overhead so that the carcase can be washed while it is being scraped.

Another form of singeing furnace is that in use in America. It is of the continuous type, and designed for very rapid work. In fact, the singeing is only regulated by the number of pigs it is possible to hook on to the apparatus. The construction is simple, but necessarily substantial. The pigs are partially or wholly scraped by the hog-scraping machine, and are sent along the track bar suspended by the lower jaw (the "gob"). This track bar terminates under the central "stack" of the furnacc. The "stack" is surrounded at the base by a fire place with feeding doors, is raised on a platform sufficiently high to enable the track bar to travel in beneath with two feet or so of clearance, and has a smoke chimney running off obliquely at the top. By a series of sprockett wheels an endless chain is led right through the furnace, and is kept constantly revolving round. As the pigs come to the end of the track they are hitched on to the endless chain, and are carried through the furnace, out at the top and down again, disengaging themselves as they arrive at an oblique board leading into a cold water tank into which they drop, and from which they are picked up, and the processes of cleaning, etc., are continued.

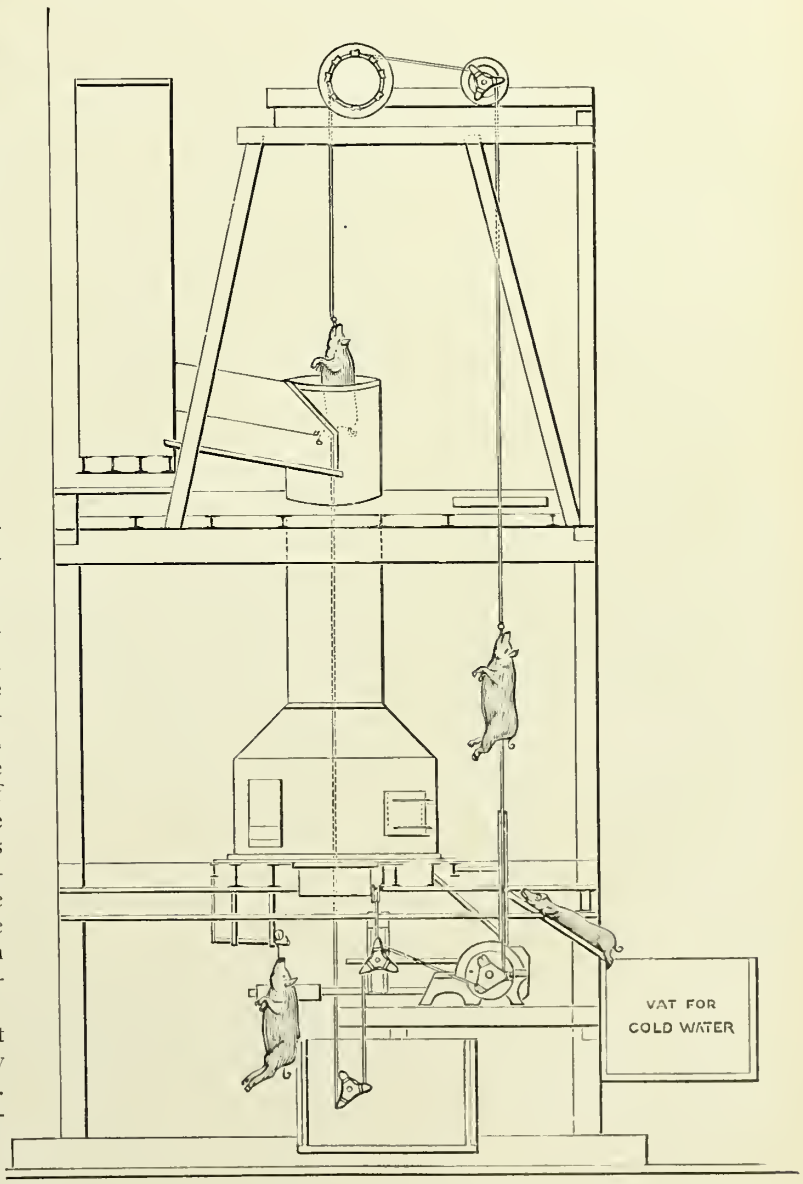
The most economical of all the singeing furnaces yet invented is the "vertical singeing stack." It consumes very little coal, and has no complicated parts to get out of order. It is claimed for this singeing stack or furnace that it supersedes all others, because of its great economy in fuel, its ease in working, and the rapidity with which the work can be thoroughly accomplished.

The furnace consists of a vertical brick shaft, strongly made, bound and stayed, and built of the best fire-bricks procurable. This structure is raised on four columns which, besides carrying the singeing stack, also carries a platform from which the fuel is fed to the fires. Surrounding the stack is a series of upright iron bars carrying the louvre roof.

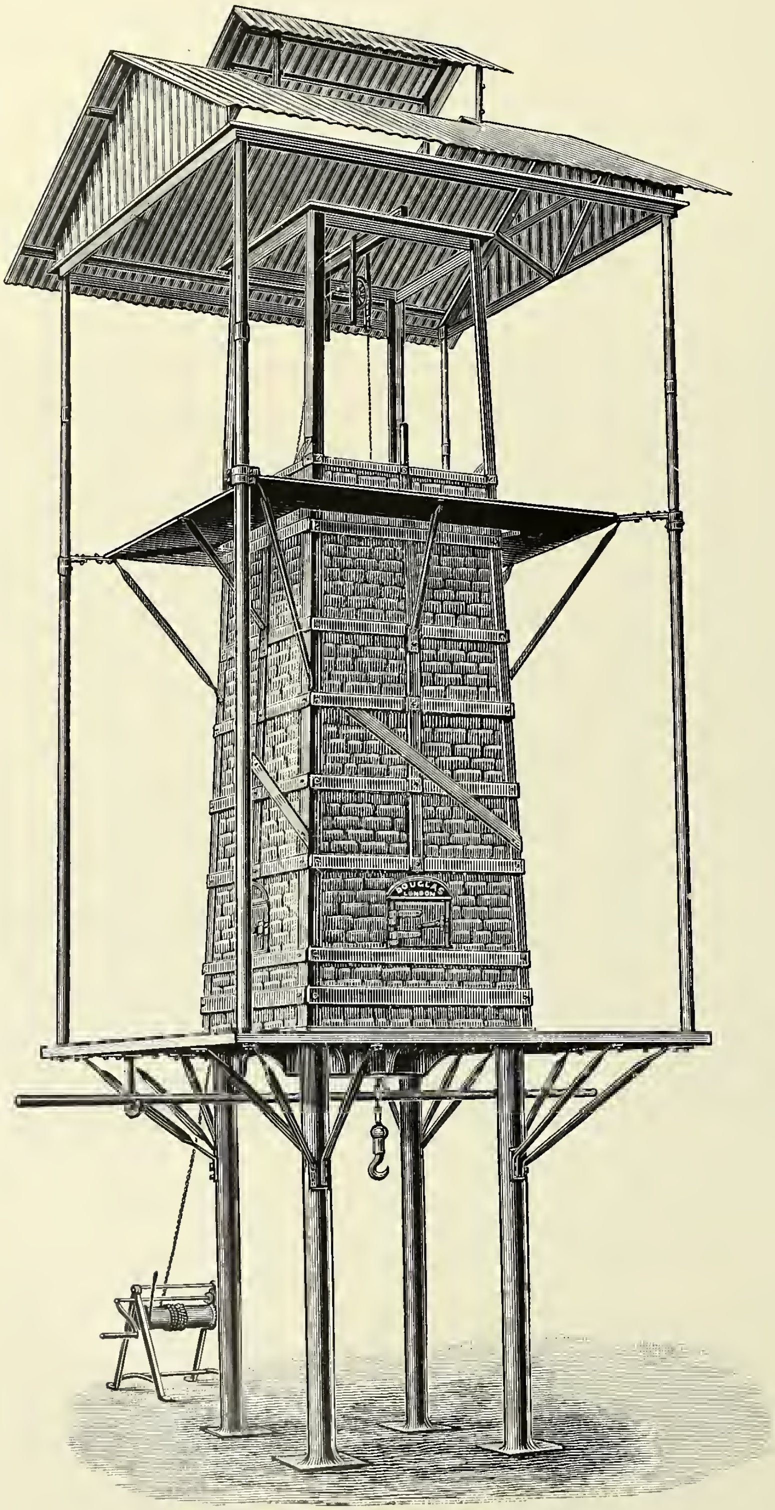
The method of working is as follows :—

The pigs when slaughtered are scalded and scuttled free, or almost free, from hair by means of bell scrapers on scuttling table, or by means of scraping machine.

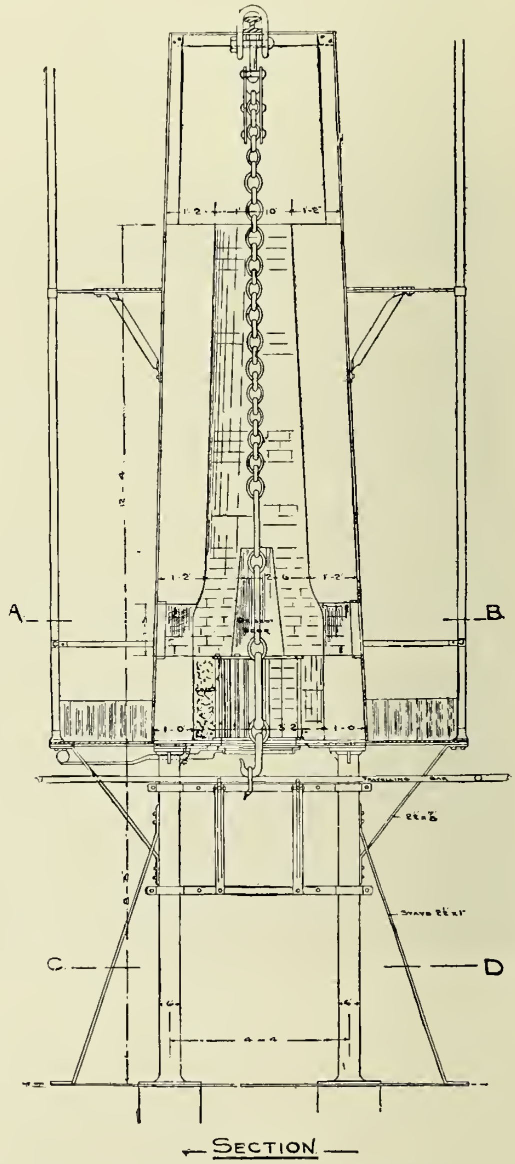
A gob hook is then inserted at the apex of the angle of the lower jaw, and the pig slid down an oblique board from the scuttling table. One of the lugs of the double lugged gob hook is mean whileplaced on the track bar, and so the pig is suspended. Immediately it is pushed along the track bar until it rests beneath the cresset of furnace. The strong hook attached to the heavy chain inside the furnace is then dropped under the free lug of gob hook. A winch is set in



American Continuous Pig Singer.



Douglas s Vertical Pig Singeing Stack or Furnace.



Section through Douglas's Vertical Pig Singeing Furnace showing the Internal Structure.

motion, and the pig raised through the cresset into the flame of the furnace. As soon as it is raised a revolving damper, fitted with a counter-poise for swift working, is swung round, and the bottom of furnace closed. The damper is immediately swung back again and the singed pig is lowered on to the track bar, and pushed along same until the end is reached. The pig is then dropped into a cold bath, raised again by means of a swivel hook or gambrell, or two (left and right) track hooks to track bar, scraped with flat scrapers, and then treated in the usual way.

The cresset or barred circular framework forming the circular fire is the only part liable to get out of order, and when it requires renewal it is only necessary to take bolts out of lugs under bottom ring, the whole can then be lowered by the chain and winch; a new cresset can then be put on ring and hoisted into place, saving all the costly building in of new track bars, burning of fire-bars, etc., as in some of the old singeing furnaces.

It is further claimed for this furnace that :—

1. It consumes very little fuel. As a matter of fact it uses only hundredweights of coals for tons used by most other furnaces, and with a better result. After using singer it is only necessary to remove the fire-bars with a hook, and the remaining fire falls down and can be burnt in boiler fires, thus saving the cresset and reducing the cost of singeing.

2. It saves labour in scraping. Four pigs can be easily scraped and cleaned by the same number of men in the same time it takes to clean two from other furnaces, owing to the uniform heat on all parts of the pig, every part is singed alike, and there are no raw or tender spots.

3. It saves costly foundations and building of chimney stack as required by others, the cost of same in some cases being almost as much as total cost of singer.

4. It takes up half the room required by other furnaces.

5. The fire can be got ready for singeing pigs in half-an-hour, while it takes two hours to get up heat in some other furnaces; the same amount of coal used to get up heat in other furnaces will singe 150 pigs in this, besides getting up fire. In singeing small lots of hogs the saving is enormous.

6. The feet are not injured, neither are any of the hams or fore-legs cracked and rendered unsaleable. The bellies are also thoroughly singed, thus avoiding slime in warm weather.

7. The singeing is complete, and is done simultaneously owing to the fact that a circular cresset throws out a perfectly uniform ring of smokeless flame. Every part of the pig is burned alike.

Taking the Hides from Pigs.

8. It is the most speedy furnace known. Four pigs per minute are being singed in some of those already erected, and five pigs per minute is a quite attainable speed, should that be desired.

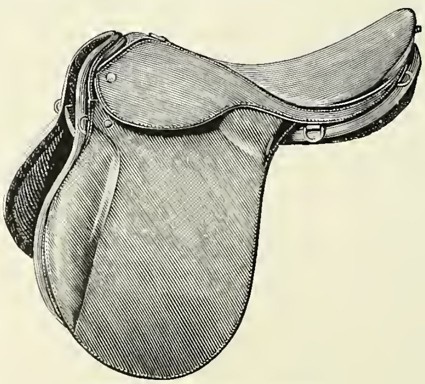
Pig Skins (Tanned).—The industry of tanning pig skins is confined mostly to Scotland in consequence of the supply of hides being centred there. In Wiltshire bacon factories it is not the custom to remove the pig skins. The skin forms part of the sides of bacon. In Scotland, however, the bacon and hams cured are subjected to different treatment, and are rolled for the most part. The skins can therefore be removed without any detriment to the appearance of the meat.

In the great sausage-making districts of England, such as Birmingham, Leicester, and Bristol, it seems to be quite unknown that pig skins are a marketable commodity —otherwise, they would be removed from the large sausage pigs, and sent to the pig skin tanner.

When the skins are removed, special attention is necessary to the process of flaying—inasmuch, as the careless flayer is apt to cut the skin, and, by so doing, spoil it. In fact, the blemish renders a skin almost valueless.

A "native" Scotch pig skin measures on the average 4 ft. long by 3 ft. 6 in. wide. The long measurement is taken from the back of the ear to the root of the tail, and four feet is the standard length adopted. Every inch over that measurement is paid for at so much per inch extra. There are, of course, many large skins—some, from big sows, measuring 6 ft. long, but these are not nearly so fine in the grain as the others. Foreign skins, also, are said to be usually inferior to the Scotch fed pig skins. England and Ireland contribute very little to this industry, and what skins are obtained in these countries are very inferior.

The raw hide when it arrives at a tannery is measured first, and then the fat from the inside is removed by a currier's knife. This fat amounts to a good deal, owing to the fact that the pig skin and the fatty tissue surrounding the body are homogeneous, and not easily separated. When the fat has been removed, the skin is thrown into a lime and water vat, where it remains until the hair is easily removed. When this occurs the hide is taken out, and the hair taken off. The next process is the first in the process of tanning, and consists in placing the hide in a tan to give it a colour, after which it is placed in another tank with tanning liquor, and kept constantly agitated by a revolving paddle-wheel. From here it is put through the various other tanning vats until quite tanned, after which it is removed and dried by ordinary air. The tanned skins are then put into the hands of curriers and are dressed—their principal uses being for furniture covering, bookbinding, bicycle tyre making, saddle making, pocket books, purses, and, in fact, almost every purpose for which leather is used.



Saddle made from Pig Skin.

It must not be supposed that pig-skin wears because it is thicker than other leather. It really wears well because of its porosity; the moisture evaporates from it instead of remaining in the leather, and making it hard and brittle as in the case of cowhide.

The bye-products of pig skin tanning are considerable, and consist of the fat already referred to, also the products of waste. They do *not* make purses of the sow's ears, but these organs are boiled down along with the tails to make a kind of size.

Pig's Head, Filled.—see Filled Hog's Head.

Pigs' Heads.—When pigs are weighed, cut off the heads and put them in the cellar on a rack till next morning, and then split them into four parts. One half (the lower) is called the "chaps," and the upper the "eye pieces." Put them into a slate tank for four hours to soak the blood out, and then throw them out and let them run dry for about an hour. Pump the chaps at the lean part and put them in brine for four days, and then salt them for seven days in piles, and they are ready for use, but may be left for a day longer. They may now also be smoked if so desired. Eye pieces may be used after three days in brine, strong enough to make them float on top of it (100° on salimometer).

Pigs in Cape of Good Hope.—see Cape of Good Hope.

Pigs in New Zealand.—see New Zealand.

Pigs in Nova Scotia.—see Nova Scotia.

Pigs in South Australia.—see South Australia.

Pigs in Tasmania.—see Tasmania.

Pigs in United Kingdom.—see Live Stock Returns.

Pigs in Victoria.—see Victoria (Australia).

Pigs in Western Australia.—see Western Australia.

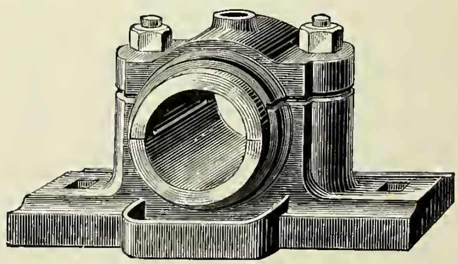
Pigs.—see Large White Pigs.

Pigs (Sugar or Molasses Feeding).—see Molasses or Sugar Feeding for Pigs.

Pimento.—see Allspice.

Pistachio Kernals.—The fruit of the pistacia or pistachio tree which is cultivated in all parts of the South of Europe and North of Africa. The tree grows naturally about 20 feet high, and is a native of Persia and Syria. The fruit is about the size of an olive; the kernel or nut divides into two halves when ripe. The envelope should always be separated from the kernel by steeping in hot water for half an hour, then dried with a towel. The outer skin is then easily removed. The kernel resembles the sweet almond in its properties. It has a delicate flavour and is very oleaginous. They are much esteemed on the Continent, and are also becoming familiar to the epicure in this country. The tree grows well in England, but the climate is against the fruit coming to maturity—and severe frosts often kill the trees outright.

Plummer Block.—A cast iron frame into which are fixed gun metal bearings for carrying lines of shafting. The plummer block is fastened by means of bolts to a wall-box, bracket, hanger, or any other arrangement, whereby the shafting is kept in line through the building or factory.

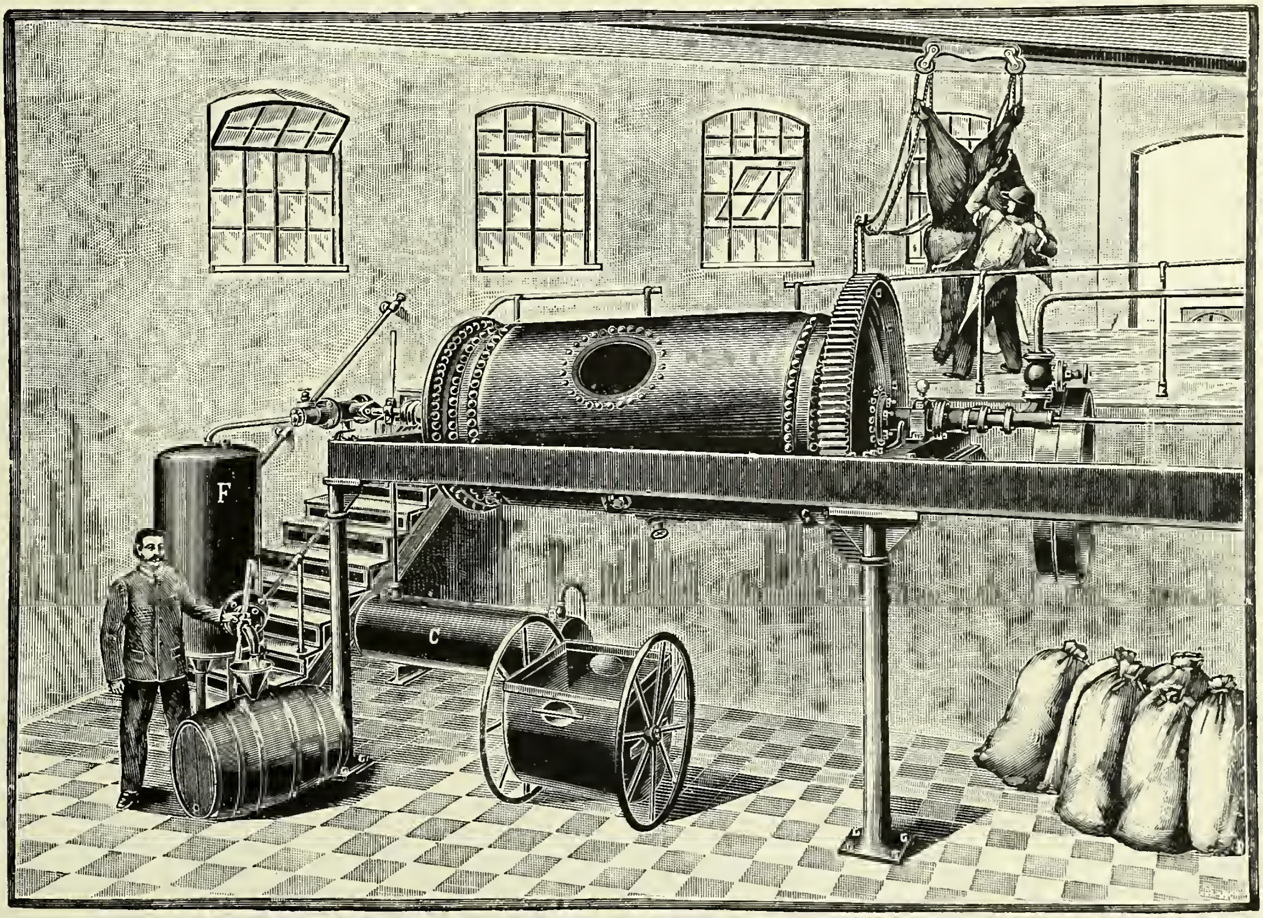


Plummer Block

It is quite a common thing to have plummer blocks made with a swivel, thus making it much easier to adjust the level or enable the shaft to be run easily although not thoroughly true to line.

Podewils Apparatus.—*General Remarks about the Working Up of Diseased Animal Carcases, Animal and Slaughter-House Refuse.* — Sanitary authorities are now universally taking into serious consideration the disposal of the flesh of animals unfit for human food, and dangerous to the community by its noxious and infectious nature. The mere removal of these substances from cities offers, however, contain the phosphoric acid and the potash, whilst the valuable nitrogen, as well as all the organic substances, are entirely lost.

Modern science demands that, whilst working up the carcases, there should be a radical manner of rendering them perfectly innocuous, and of extracting from them all useful matter in the form of a marketable commodity. To a certain extent this has been accomplished by adopting, with slight alterations, the modern improvements introduced in bone and glue works, such as the closed digestor, with perforated false bottom for separating the fat, and with apertures for filling and emptying an apparatus admitting of



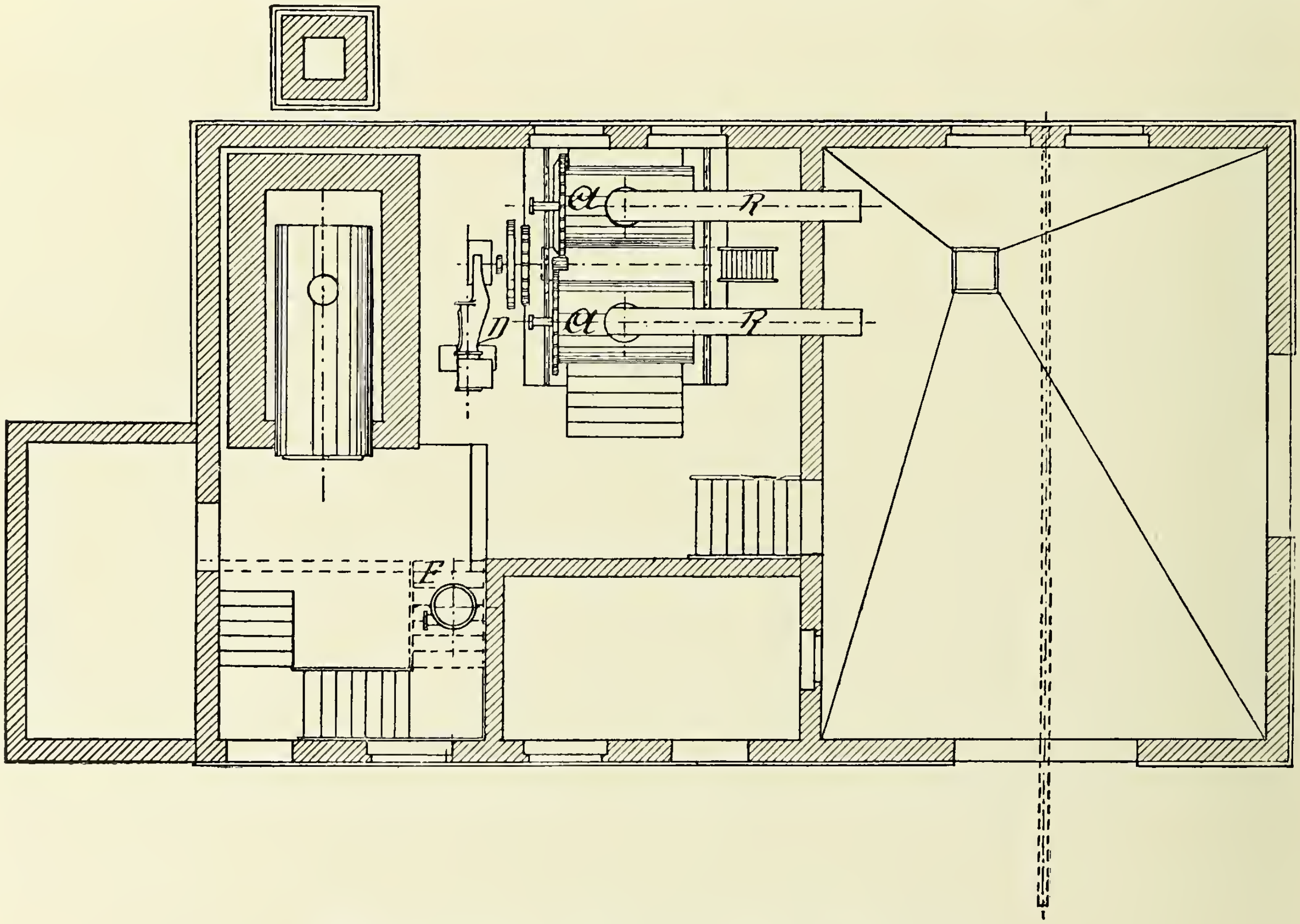
General Arrangement of Podewils Apparatus for converting condemned animals in an innocuous manner into fat and a dry powder of great value as a manure, and for feeding certain animals.

no security, unless it goes hand-in-hand with a process of making them thoroughly innocuous. When the means by which this is now generally done at the knackers' and elsewhere is closely examined, it is found that the method of work is the same as has been employed for centuries.

In many places it has been customary to bury the bodies of dead animals in the ground. This, however, only hides them from the eye without doing away with the danger. Indeed, scientific investigation has proved that, even after a ten years' burial in the soil, the germs of contagious disease were still full of vitality. A scarcely less antiquated method is the destruction of the carcases by cremation in "destructors," with the sweepings and ashes of dwelling-houses. The sole result of this cremation is ashes, which only very high steam pressure. These appliances, apart from the application of high steam pressure for the purpose of destroying the infectious spores, offer really no particular advantage, yielding often, only half products, such as half-dried remains of flesh and bones, which require to go through a further process of manipulation by special machinery.

The Podewils System.—By their special patent apparatus, the "Podewils Fäcal Extract Company" have effected a perfect revolution in the mode of destruction of animal carcases and offal. The Podewils apparatus was only offered to the public after it had been tested in every part, and was at once employed in slaughter-houses, and for working up carcases and animal refuse.

This system is the only one known to us which effects the thorough working up by a single apparatus. The different parts of a carcase are steamed (the air being pumped out), disinfected, freed from fat, dried and pulverised, and the various substances remain within the apparatus till all, including hide and bones, is changed into dry powder and pure fat. In this way every valuable ingredient in the carcase capable of being turned to account is obtained; even the so-called "glue water" or "gluey extract" is dried up, which, owing to its loathsome qualities, has hitherto been an ugly drawback. The apparatus works automatically, and performs all the difficult and disgusting operations of working up the carcase in a sanitary and technically perfect manner. It requires very little attention, and works with the least possible amount of steam. We understand that it has proved itself thoroughly efficient in places where it has been in regular use for many years.



Central Podewils Works for the District of Friedberg in Hesse—Ground Plan.

Construction of the Cylinder.—The principal part of the apparatus consists of a strong jacketed cylinder, resting on two hollow cones, with double vaulted covers. Through a pipe which is supplied with various adjustments, the steam first enters the cone on the one side; from this it goes into the steam case and the other double cone as well. Through another pipe which is conducted through the same cone with stuffing-box, the water condensed in the steam case is let off and again made use of, to feed the boiler. By a steam conduit steam can be introduced into the interior of the apparatus. The steam from the carcase passes through a pipe to a condenser. This pipe, which has holes punched into it like a sieve, can be turned from outside by means of a lever, and is connected with a small strainer. Inside the cylinder, but not attached to it, is a hollow roller.

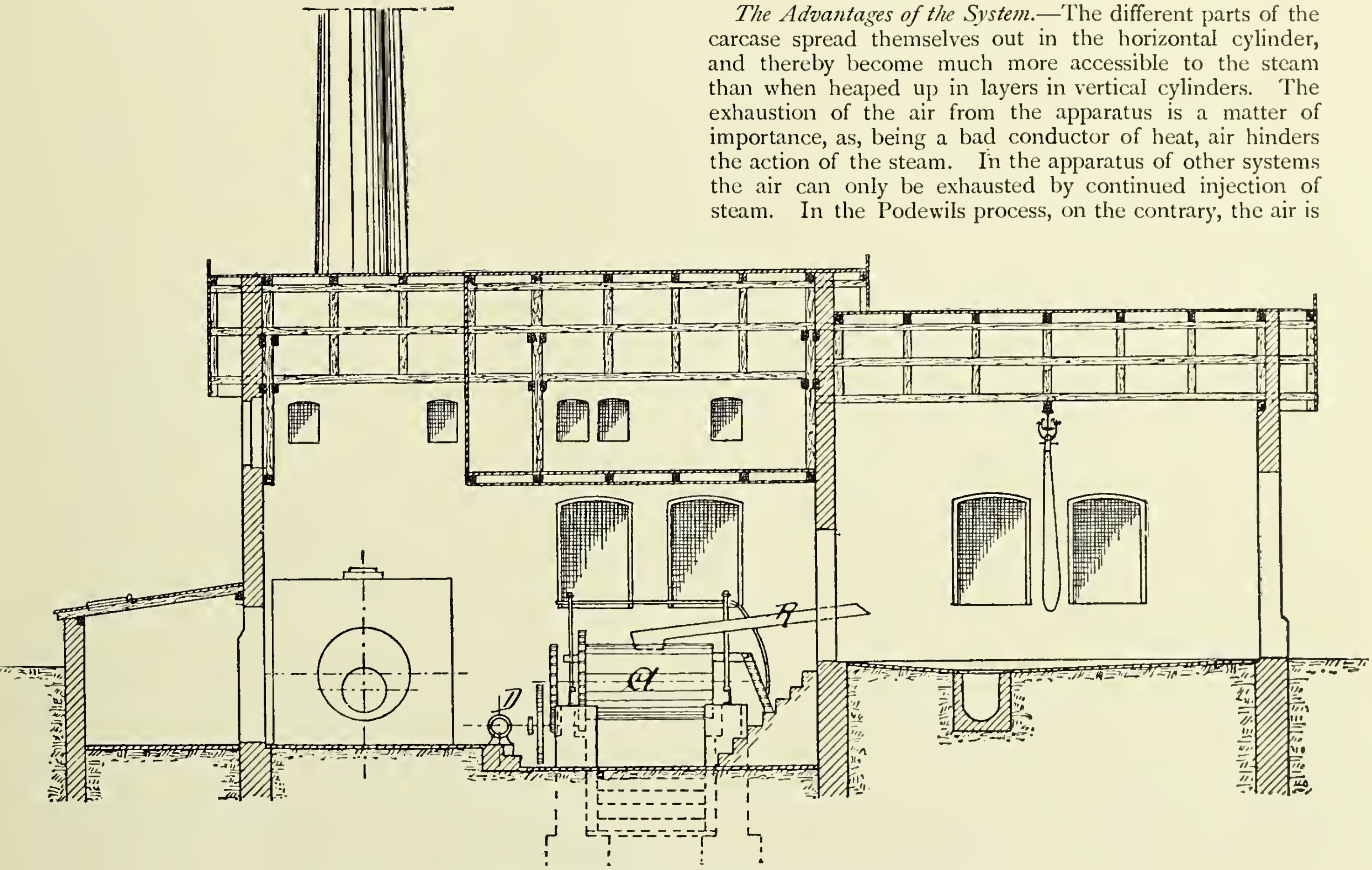
All the parts of the apparatus are made of the best materials. The cylinder is made of carefully welded, strong boiler-plates; the cones are of forged steel. The cogged rim for turning the drum is screwed fast to the outside plate of the steam-jacket, and the whole outside surface of the drum is protected against loss of heat by the usual patent boiler covering. Along with the apparatus is supplied a simple cylindrical closed vessel ("fat-separator") for separating the glue-extract from the fat. This vessel takes up the greasy extract out of the apparatus for a short time, in order to make a thorough and repeated separation of the fatty particles possible. The separated fat which floats on the surface is passed through a rotatory tube, and flows into grease tubs, and the gluey extract which remains runs back into the cylinder.

Working of the Apparatus.—When the drum is filled with material and the manhole closed, the air is at once exhausted by means of an air-pump. After this the process

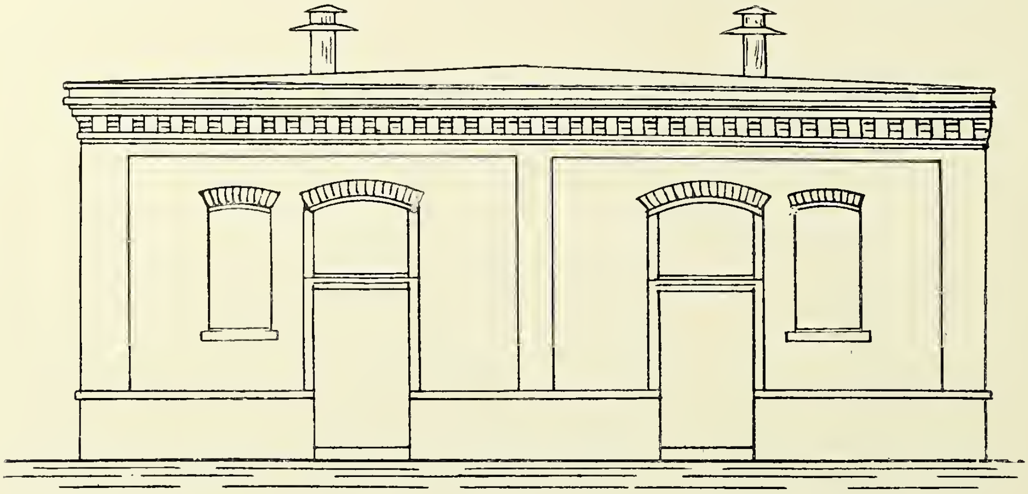
of steaming commences by introducing steam into the interior of the cylinder. The process of condensation on the relatively cool carcases brings up the temperature to 160 deg. C., which is sufficient to extract the fat and glue; the bones, sinews, and hoofs lose their consistency, and after a few hours the whole mass is reduced to a pulp. Upon this, the drum, which has been at a standstill, is allowed to rotate for a short time in order to keep the contents in a state of agitation, so long as they are in a pulpy state, and thereby to facilitate the thorough separation of all the fat from pieces which may not have been exposed. Presently the apparatus is brought to a standstill, and the fat swimming on the surface is pressed through pipes and into the cylindrical vessel or "fat-separator" described above. First, however, the conducting pipe connecting with the vessel is opened, and the other pipe made to turn by the lever so as to come into contact with the upper layer of fat; the pressure in the drum sends the fat into the vessel, and in order to do this most completely a part of the juice is allowed to flow over with it. The fat is removed from the vessel by means of a rotatory pipe, but the surplus extract is pressed back into the drum, where it dries up easily with the other contents. In the meantime the drum is again set in motion, and for the purpose of drying, the jacket as well as the covers are heated by steam. The vapours arising inside, from the process of drying, are conducted by pipes to the condenser, and condensed in the same. The steaming in the rotating drum is continued till at last the mass in the apparatus is pulverised by the heavy roller which moves loosely in the cylinder as the latter revolves. After the drying is completed the manhole is opened, whereby the apparatus, after about forty revolutions, empties itself automatically. The manure-powder is thrown through a screen, and any lumps remaining are put back into the apparatus to be repulverised. It is noteworthy that the product gained is not only a splendid manure but an excellent fodder, and has lately been successfully used for feeding fish and pigs.

The Advantages of the System.—The different parts of the carcase spread themselves out in the horizontal cylinder, and thereby become much more accessible to the steam than when heaped up in layers in vertical cylinders. The exhaustion of the air from the apparatus is a matter of importance, as, being a bad conductor of heat, air hinders the action of the steam. In the apparatus of other systems the air can only be exhausted by continued injection of steam. In the Podewils process, on the contrary, the air is pumped out by an air-pump which, connected with a condensing jet, performs at the same time the condensation of the foul-smelling vapours. In this way a much quicker and more evenly distributed effect of the steam on the carcase is produced. But the principal advantage of the apparatus is that, besides a most thorough steaming of all parts of the carcase, it effects the evaporation of the nauseous meat-juice or so-called "gluey extract" as well as the perfect drying of the carcase and its complete pulverisation.

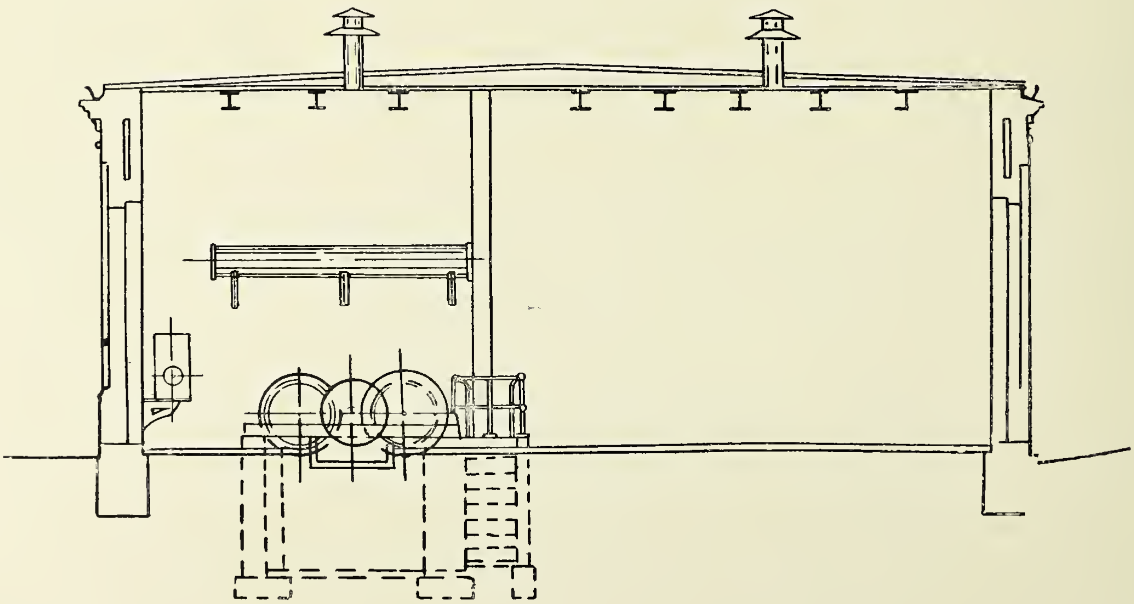
The employment of one and the same apparatus for the whole process brings with it a number of additional advantages. The grinding and drying being done simultaneously while flesh and bone are in their softest state,



Central Podewils Works for the district of Friedberg in Hesse. Longitudinal Section.

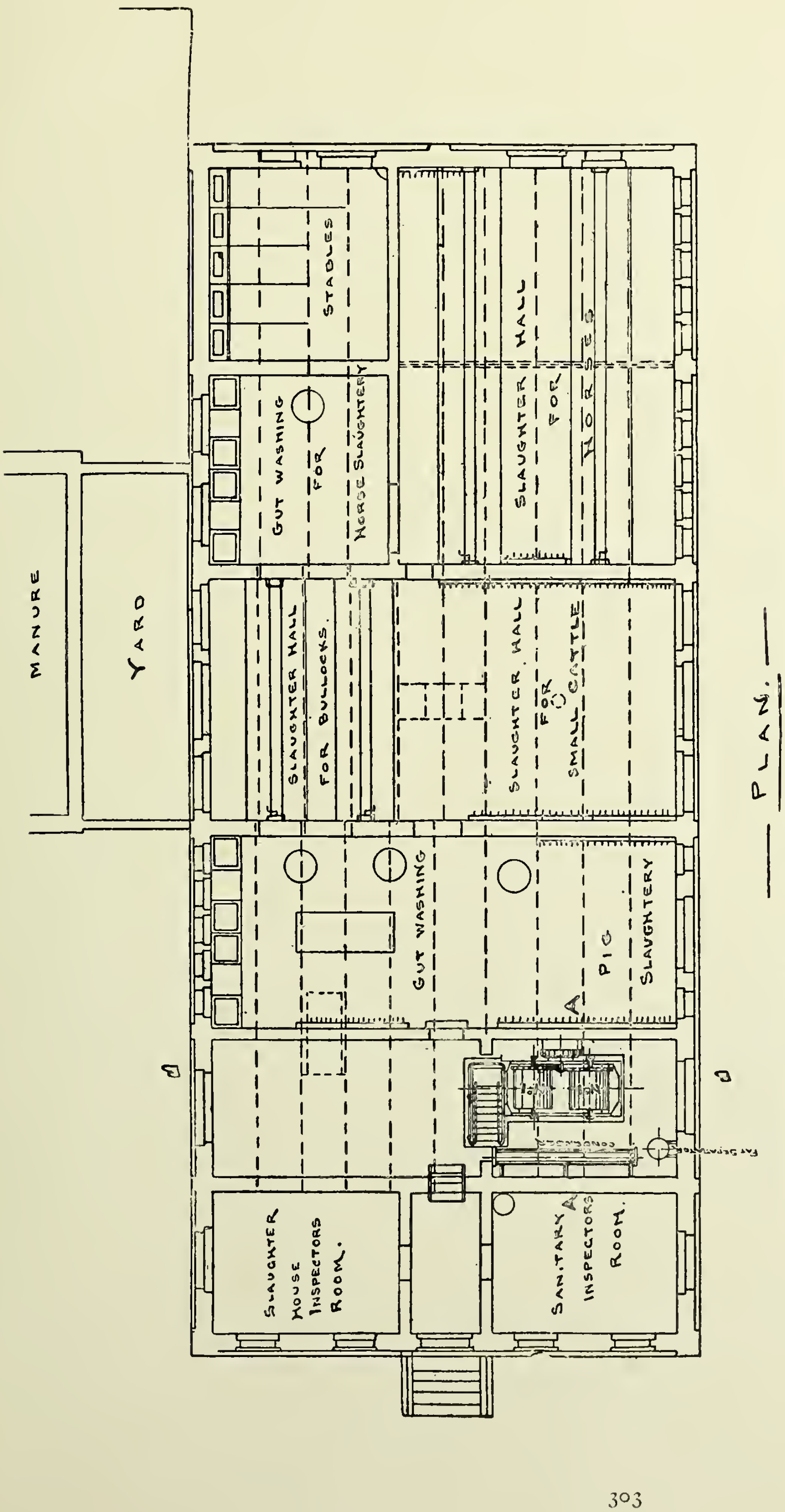


SOUTH ELEVATION.

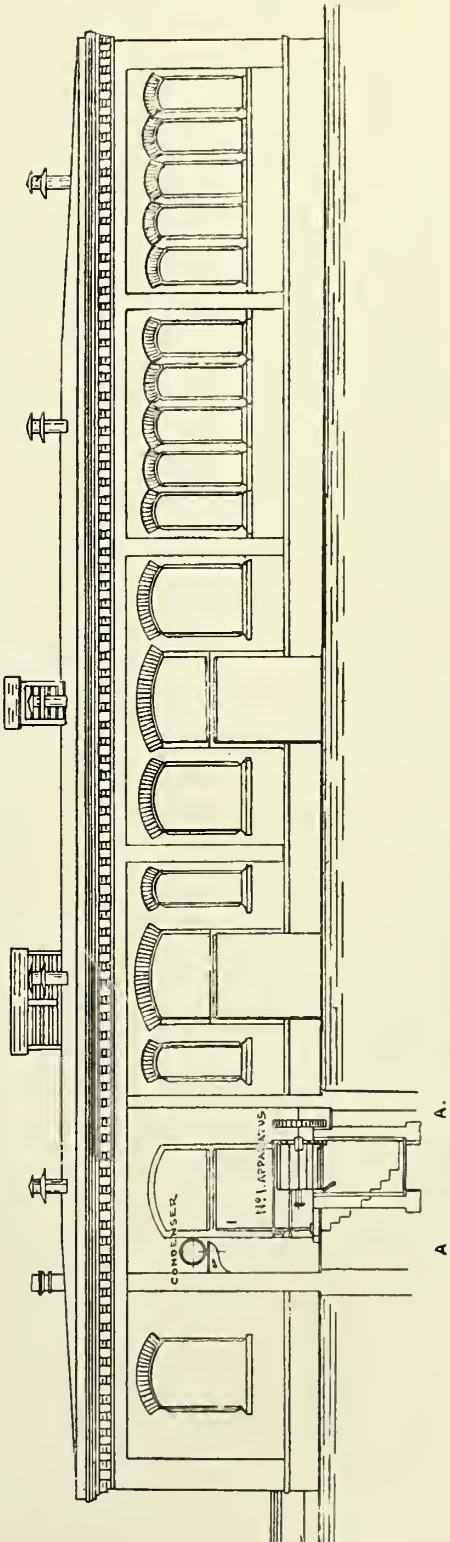


CROSS SECTION B.B.

Barmen—Diseased Animal House.



Barmen Abattoir—Ground Plan of House for dealing with Diseased, Suspected, or Condemned Animals or Carcases.



Barmen Abattoir—Front Elevation of Slaughter-house for Diseased Animals and Podewils Apparatus.

there is a considerable saving in fuel. As the product of the apparatus is pure fat and marketable manure-powder, no intermediate transport ot half-finished product is necessary. All the waste fluid resulting from cutting up the carcases, and even the dirty wash-water of the slaughter-house, is worked up, and every germ annihilated—a most important result from a sanitary point of view, especially in the case of carcases of infected animals. This fact is fully appreciated and taken advantage of in all the places where the Podewils system is in operation. As a last but by no means the most insignificant advantage, the fact may be mentioned that the carcases, etc., remain enclosed in the cylinder free from air, and the Podewils apparatus is the only one which admits of a perfect condensation of the vapours, not only during the first stage of steaming, but up to the perfect drying up of the carcases, therefore it offers the security of really perfectly odourless treatment. One single apparatus only is needed for all the purposes of steaming, disinfecting, extracting the fat, drying, pulverising, evaporising the gluey extract and the waste water, special drying and grinding machines being dispensed with.

The Practical Application of the Podewils System.—The Podewils apparatus incorporates in itself the experience of many years and all the improvements which in recent times have been made in kindred branches of industry. During the fourteen years' working of the apparatus, it has been perfected and freed from all the unnecessary accessories. Notwithstanding the three-fold performances of the apparatus, high-pressure steamer, drying apparatus, and pulverising machine, it is simple, reliable, and durable. But its use is not confined to carrying out all the necessary procedure in the treatment of infectious carcases. The quantity of rejected meat varies very much on different killing days, and when, for want of matter, the apparatus stands idle, it can be employed for working up blood and every kind of offal from slaughter-houses—for instance, the entrails, horns, hoofs, tendons, refuse of fish, etc., also leather, skins, and other animal matter. When dealing with some of these substances the steaming process may be dispensed with, the apparatus acting as a drying and pulverising machine only, so that it is eminently fitted for use in every slaughter-house.

As the apparatus gives off no offensive vapours, there is no objection to its being placed in close proximity to the abattoir, from which condemned meat and the offals from killed animals, etc., are easily conveyed to it, while infected carcases are brought direct without coming in contact at all with the slaughter-house proper.

Pole Axe.—A butcher's or slaughterer's killing axe. It is sometimes made in the shape of an axe, and sometimes more like a hammer; but the deadly part is the elongated

Butcher's Pole Axe.

part at the back, which is usually made with a cup end, and which, when deftly wielded by an experienced man, never fails to do its work in an almost instantaneous way. The handles are made of selected ash or hickory. Stunning the animal with a pole axe is the regular practice in the London and Paris abattoirs, excepting with animals killed for Kosher meat—the Jewish laws regulating the killing of an animal making it imperative that a knife only should be used.

Polish Sausage.—This is the national sausage of Poland, loved by rich and poor.

Take 25 lbs. of pork, two parts lean, one part fat, which has been salted for a few days with 1 lb. salt and a little cane sugar. Grate down finely three sticks of garlic, salt them, stir in amongst them a quart of water; then add the meat which has first been chopped into pieces the size of hazel-nuts. Now add $1\frac{1}{2}$ oz. pepper, $\frac{1}{2}$ oz. nutmegs. Mix well and put into narrow pigs' skins very full: the skins should be 2 feet 6 inches long. The sausages are then filled, tied up, and doubled; each sausage will measure 15 inches. Hang them on a smoking-stick to dry for a day. Then smoke them with beech-wood at a heat of 133° Fahr., and let them hang until they are thoroughly cooked inside merely with the hot smoking.

They can be made in the hottest of weather without being spoiled. The garlic need not necessarily be an ingredient. If one should prefer to boil this sausage, then give only a light smoke until the sausage is a yellowish-red colour, and boil afterwards, directly after smoking, for twenty-five minutes.

This sausage is considered especially suitable for hunters. Some prefer it to the finest of Strasburg liver-pies.

Poloney Dye.—*Poloney Dye (Common).*—Is a scarlet dye, most generally used for poloney sausage dyeing, and is prepared as follows:—1 oz. is added to every gallon of water used, and should the requisite shade of colour not be obtained, it can either be intensified or reduced by the addition of either dye or water. It is always desirable to have a considerable quantity of solution of dye at hand, and for this purpose a large iron vessel, or a 36 gallon barrel with one end stove in, may be used. When the dye is required for use it should always be heated—preferably by means of a steam-pipe going down to the bottom of the barrel—and regulated with a tap. Poloneys should never be dipped in boiling dye—it should be luke-warm only. Another barrel of a similar size is necessary, and into it is put, say, 20 gallons of cold water. To this add 2 lb. or 3 lb. of alum, and stir till all is dissolved. This solution is always used cold. When the poloneys are cooked, fish them out of the copper and plunge into solution of dye, and be careful to see that no blobs of fat adhere to the skins, as in that case the dye will not *strike.* When satisfied that they are sufficiently dyed, fish them out and plunge into the cold water and alum. Take them out and cool on a rack or table. If you have time to do so, turn them once or twice so as to prevent the moisture from settling in one side. When cold, rub them with a towel, and they are then ready for sale.

New Poloney Dye.—A new kind of dye has come into use recently, and requires different treatment altogether from the foregoing. The new dye is conveniently described as "No. 2," and will not penetrate the skins. Undernoted are the instructions for use:—

Poloney Sausages.—Add from one to two tea-spoonfuls of the dye to the water in the boiling copper before putting in the goods for cooking.

Ham, Chicken, and Tongue Sausages.—Dissolve at the rate of one ounce to every gallon of water by boiling. Keep this solution by itself. After the sausages are cooked in the ordinary way, dip them into the above solution, and keep them in it until they have the proper shade. Fish them out and plunge into cold water, then take them out, and cool and wipe in the ordinary way.

This dye is used for poloneys, ham, chicken, and tongue sausages, Yorkshire poloneys, and all other sausages requiring a bright scarlet colour.

Poloney Factory.—see Model English Sausage Factory.

Poloney Sausage.—see Yorkshire Poloney Sausage.

Polselak.—Sausage varnish: a kind of varnish used in Denmark, Sweden, and Germany for painting sausages that are to be kept. It has the colour of polished mahogany.

Population and Areas of different Countries.—see Area and Population of Different Countries.

Pork.—Pork is dangerously unwholesome when ill fed or in any degree diseased, and its quality should be closely examined before it is purchased. Two million hogs are slaughtered in New York City yearly.

The hog has 42 teeth and usually a cloven hoof, though the native hogs of Norway, Sardinia, and Illyria, and formerly the Berkshire hog of England, did not have a cleft hoof, it being entire.

Pork, like veal, should be eaten soon after being killed. The hog is always cut into halves, splitting down the backbone; the head cut off, and the halves divided into quarters. The fat meat should be very white and clear of any blemish; the lean of a delicate red, juicy, firm and finely grained. In the best pork, the skin should be thin and pearly, smooth and cool to the touch. If it be clammy, the pork is stale. If the skin is thick, the pig is old. If the fat be full of small kernels, it is indicative of disease. If the fat is yellow and soft, it is inferior.

The hog is termed by the Israelites unclean, and they will not eat him. But of all kinds of meats, it is, perhaps, the most economical for food, there being a less proportion of bone to the meat than either in beef or mutton. A pig of 180 to 200 pounds yields 75 to 80 per cent. of available food.

Pork, in cooking, loses 13½ per cent. its weight. In England the hog, to be made into bacon, is often singed instead of being scalded.

Pork and Beef Sausage.—see Cervelatpolse.

Pork Cheese.—The rind is cut from the belly and neck pieces of a hog with ½ in. of fat. Then place in a deep vessel a square piece of linen large enough to let its tips overlap the rim, place the rinds on the linen around the sides of the vessel, leaving the fat on the upper side. Take the thick legs of a hog, ½ hog's head, 1 pig's cheek; cook and cut in long strips several pickle calf or hog's tongues. Place a layer of the cut meats in the pan lined with rinds, sprinkle over this a portion of the following mixture:—2 oz. salt, 1 oz. ground pepper, ⅛ oz. carraway seed, add another layer of meat, sprinkle with more spice, and continue until all the meat and spice is used. The remaining rind may be placed on top of the meat, fat side down. Tie the ends of the cloth firmly over the whole; hang in a kettle of boiling water for one hour. Remove and place between two boards, with weight on top, for 24 hours. The cloth may then be removed.

Pork (Curing Fat).—The process of curing fat pork differs entirely from the lean. The fattest pork may be pickled through and through in eight days, and will stop absorbing salt when properly cured, while with lean, the longer it lays the more salt it takes. Mess pork may be prepared in eight days, and may be kept for years. It is just the reverse with lean bacon and hams, as they do not improve with age, but acquire a more smokey flavour and a yellowish appearance.

Pork (Danish Production of).—see Danish Production of Pork.

Pork Inspection, U.S.A.—see Inspection of Meat, U.S.A.

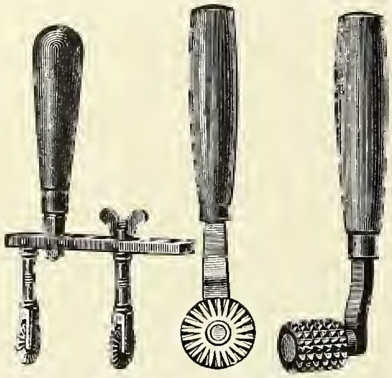
Pork in Victoria.—see Victoria (Australia).

Pork Pie Making.—*Description of Machines.*—The manufacture of pork pies has now become comparatively easy. At one time—not very long ago—the operation was a very tedious one, owing to the want of machines. From beginning to end everything was manipulated by hand. The meat was cut by hand in order to get it in square pieces, the paste was made by hand, rolled out with hand-rollers, raised by hand, and the ornaments and kneading all made by hand. It is still largely the custom to raise and knead by hand, but this is fast becoming obsolete. The other operations are done by machinery. It is necessary in pie making that the meat should be cut square, otherwise, when the pie is baked, it will be found that it has fallen quite solid and sodden inside the crust. To avoid using finely cut meat it is therefore necessary to have a machine capable of being so adjusted as to produce the meat exactly of the size required. The small "Alexander" is a very good machine for this purpose for small pie makers, as, by simply putting into the knife box one knife and one square-holed plate, the meat will be cut in one operation to the necessary size. On a large scale, however, this size of machine is not permissible, but the same machine, as designed for power, is the best for that purpose.

The bowls of these machines are enamelled inside and japanned outside. The principle is very simple. The meat is first cut up into portions about 2 in. square, the fat and lean equally mixed. Tins holding 20 lb. should be provided, and as the meat is cut it should be placed in these, and mixed with the requisite seasoning. These quantities should then be placed in the bowl or receiver, and the power put on, as shown. The horizontal portion jutting out from the left contains a screw propeller, the knives and plates. The screw carries the meat to the knife box, where it is cut and pressed through the plates, falling into receivers, ready to be placed in the raised crusts. An adjustment worth noticing is that of the double gearing. By this arrangement the spindle—which passes right through the screw, and has affixed to it the revolving knife only—travels at a greater speed than the screw. The consequence is that, at the point of contact between the meat and the plates there is no crushing or bruising of the meat. The plates are stationary. The same machine can be adapted to cutting meat any size, by simply putting in more knives and plates, according to

requirements, the large screw which keeps them in their place being fixable at any distance. It is particularly to be noted that the screw referred to should on no account be screwed up tight, as that will simply impede the machine. It should always be loose, to the extent of half a thread on the screw.

Moulding or Raising Pies.—Having obtained the meat in proper form, the next consideration is the raising of the crust. For those who prefer the old-fashioned hand method, all that is necessary for a complete moulding equipment is a

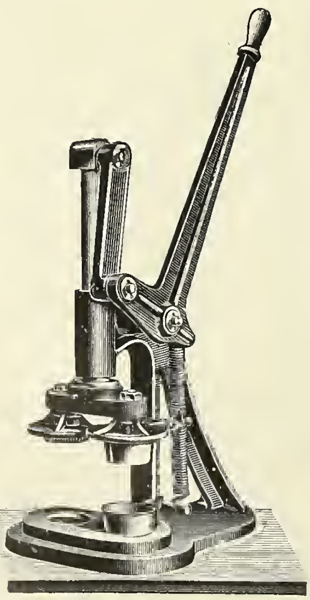


Jaggers for Kneading and Ornamenting Pie Crust.

series of wooden moulds the size of the pies desired, an assortment of "jaggers," and some paste cutters (pitcher lids are often used). The paste may be rolled out to the requisite thickness with an ordinary baking roller. For decorative work on large pies a crimping roller is necessary.

Paste Rolling.—Is conducted on the large scale with the aid of power rollers. Where a large trade is done these are very economical. The decorations, consisting of flowers, the maker's name, etc., are carved out on a separate set of rollers, and these adjuncts can thus be more expeditiously made.

Pie Moulding.— For the production of pies, especially small pies, in quantity, it is best to have a moulding machine. For pies exceeding 1 lb. to $1\frac{1}{2}$ lbs. in weight these machines are not serviceable, but for all others (such as pies sold retail at 1d., 2d., 3d., 4d., 6d., and 1s.) they are invaluable.



Double Pie Moulding Machine.

For ordinary working purposes as many tins will be necessary as there are pies to bake at one time. Thus if six dozen pies are baked at one time six dozen tins will be necessary. It is found from practical experience that to bake pies in tins is much preferable to the plan of baking them without any covering at all. The crust comes out more crisp and friable, and the bottom is eatable. Usually where pies are baked without tins the bottoms are black, hard, and uneatable. The instructions for using this machine are as follows:—

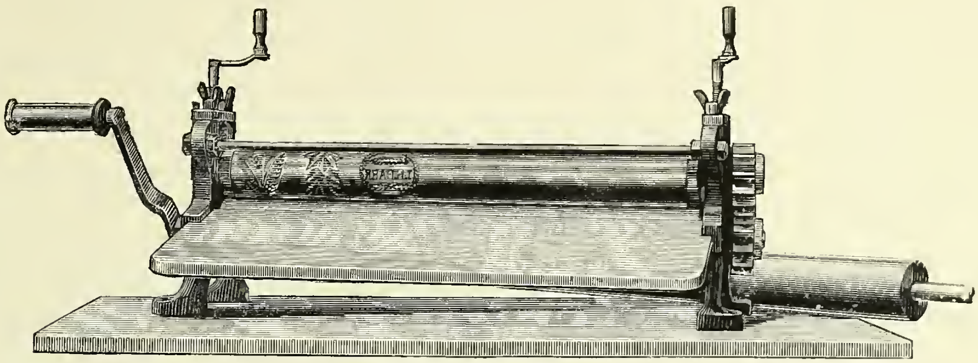
Instructions for using "Acme" Pie Moulding Machine.—Fix the machine firmly on a table in a convenient place for using. Screw the brass moulder in its place at the bottom of the piston, and adjust the brass guides by the thumbscrews, so that the brass moulder comes down true in the centre of the tin mould. (This is very important).

Roll out the paste to the required thickness, cut with the large paste cutter supplied, and put it on the tin mould. Place the mould on the machine close to the brass regulators, and bring down the lever with a steady pull until it is felt that the mould has pressed the paste to the bottom of the tin. When the lever is released the surplus paste will hang over the edge of the tin (this need not be cut off). When a sufficient number has thus been moulded and filled, roll and cut out the paste with the small paste cutter supplied, place on the machine as before, and pull down the lever until the piston bottom plate or lidder reaches the edge of the tin and cuts off the paste. The pie is then ready for the oven. No knife is required. Wet the paste in the tin before the lid is put on. The pies should be baked in the tins. The paste should be sufficiently stiff so as not to stick to the moulds.

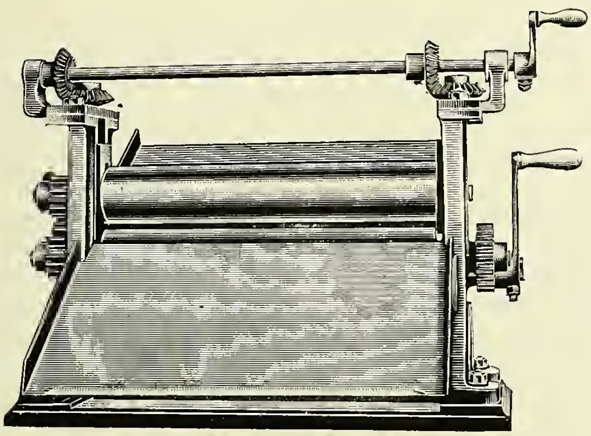
Baking Ovens for Pies.—Having got the pies moulded, filled, lidded, and kneaded, they are now ready for the oven. Of ordinary confectioners' or bakers' ovens it is not worth while speaking, as they are not adapted for pie baking. Sometimes it is convenieut to send pies out to a baker to bake in his oven, so as to save the initial cost of an oven on the premises. To send them out is the only thing possible where the pie maker cannot afford an oven of his own, but wherever possible, it is entirely to be desired that the pies should be baked under the immediate supervision of the pie maker. They require to be carefully tended, and no one can do that so well as the maker himself. Where gas is obtainable—and it is in most places—at a reasonable rate, it is best always to adopt it as the means of raising the heat in pie ovens. It is much cleaner and more convenient than coal or coke. One of the most suitable ovens is that shewn on page 308.

The principal recommendation is that the gas is not permitted to pass into the oven, but is made to heat a series of tubes which surround the whole of the baking space. The heated air thus put in circulation travels round these tubes until it reaches the funnel, shewn at back of the sketch, and then is carried into the chimney or through the wall into the air. None of the heat is wasted, and so the expenditure on gas is reduced to a minimum. The heat can be got up to baking temperature in about fifteen minutes, the larger sizes taking some time longer. One of the advantages of this oven is that the heat enters from the tubes *equally* all round so that the pies never need be "turned," and they are subjected to the same temperature at every part of the oven at once. This does away with the evil of charring the bottom of pies when the tops are not sufficiently baked, owing to the unequal temperature in ordinary fire ovens. Roast pork is equally well cooked, and with perfect uniformity, as are also "savoury ducks" and other small goods. Bread, too, can be made, and is made very largely with their aid.

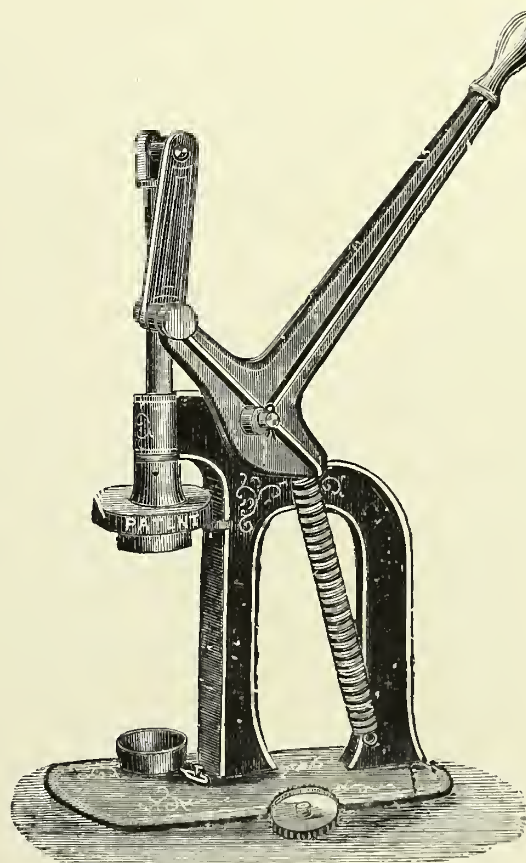
There are other ovens obtainable for heating with coal or coke, some of these, notably coke-heated air ovens, being very successful; but these are more expensive to erect, and are seldom used by pie makers in the ordinary way.



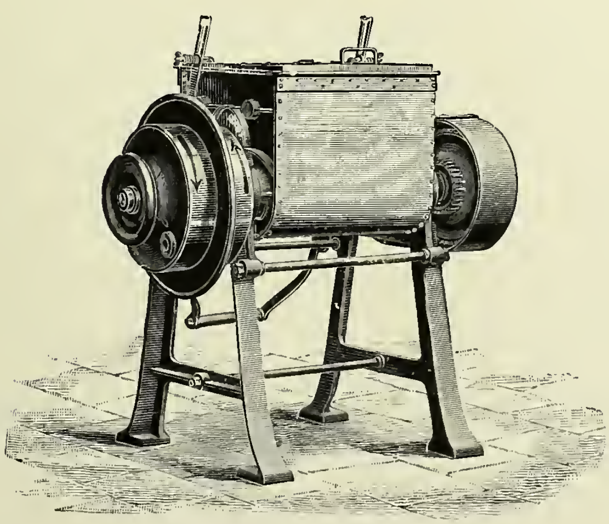
Decorative Paste Roller



Plain Paste Roller.



"Acme" Pie Moulding Machine.



Pie Paste Mechanical Kneader.

Recipés for Pork Pie Paste.—No. 1 *Recipé.*

6 lbs. flour.
3 „ lard.
2 ozs. baking powder.
2 „ or to taste, salt.

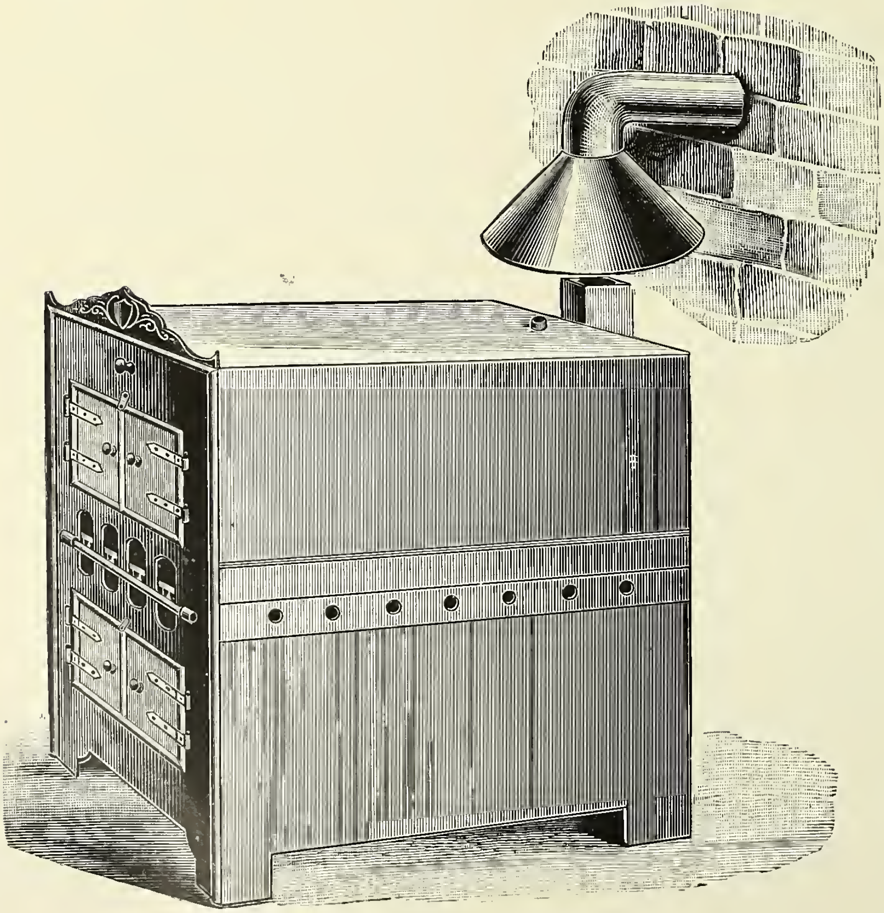
To be mixed cold, with a little water added.

This quantity is sufficient to make paste for about six dozen twopenny pies. Many prefer to add the lard hot to the flour, and on the whole this is perhaps more successful. Hungarian flour is said to be most suitable for paste.

No. 2 *Recipé.*

6 lbs. flour.
$2\frac{1}{2}$ „ boiling lard.
$\frac{3}{4}$ ozs salt.
2 „ baking powder.
1 „ cornflour.

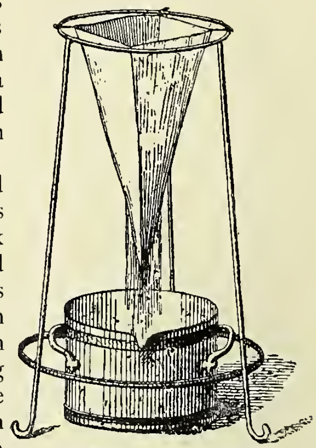
To be mixed together, adding about a small cupful of boiling water.



Portable Pie Baking Oven, Heated by Gas.

Pie Stock.—When the pies are withdrawn from the oven, they should be painted over with some egg-flip, allowed to cool in racks, in the open air if possible, and when cooling they should be punctured with a wooden skewer, and stock added through a funnel. It is well to save the rinds and bones for this purpose, boiling them for three or four hours until a jelly is extracted. In the liquid state this should then be run into the pies.

To clarify the stock it should be passed through a filter. This is made from a piece of thick woollen material, closely stitched at the seams. It is shaped as shown, and mounted on an iron tripod with a ring at the top, on which rests the ends of strong wire to which is attached the cloth. After use, the cloth should be carefully washed with a little soda, then rinsed with scalding water, wrung out and dried, so as to be nice and clean when wanted again. Another method of making jelly is to dissolve 1 lb. of gelatine in a gallon of water. When the jelly is filtered, the seasoning for it should be added, consisting of—



Pie Stock or Jelly Filter.

10 ozs. white pepper.
10 „ salt.

Add $\frac{1}{2}$ oz. to every gallon, along with 1 oz. of food preservative (dry antiseptic).

Recipé for Short Pie Paste.

14 lbs. flour.
$3\frac{1}{2}$ „ lard.
$\frac{1}{2}$ pint water.
1 oz. salt.
Knead well.

Meat for above Recipé.

12 lbs. loin pork.
$4\frac{1}{2}$ „ fat.
$4\frac{1}{2}$ ozs. salt.
$2\frac{3}{4}$ „ pepper.
2 „ dry antseptic.

Gravy for above.—4 lbs. of rinds and pork bones boiled till tender, strain, add pepper and salt, and pour liquid into pies half cold.

Meat for Pies.—The parts of the pig used for pie making are the legs, and they are usually preferred of large size, because they are cheaper and firmer.

Pork Purveyor's Cooking Pans.—In most pork purveyor's establishments the room is exceedingly limited, and they must utilise every corner of space to the best possible advantage. In no particular is this more desirable than in the cooking pans for cooking luncheon sausages, black puddings, lard-rendering, and similar operations. Convenience in working and economy in space are what are desired. Hence, any design which carries with it these advantages at once commends itself. The three illustrations shown of single, double, and treble fire pans fulfil all of the requirements—inasmuch, as

they occupy the minimum of space with the maximum of efficiency. The pans are heated, as is obvious, by fire, and surrounding them are the various adjustments which practice suggests. Thus, there are water spigotts for cold water, outlet tap for emptying the contents of the pans, lids with counterbalancing weights, and hanging conveniently around—all the necessary tools with which to carry on cooking or rendering.

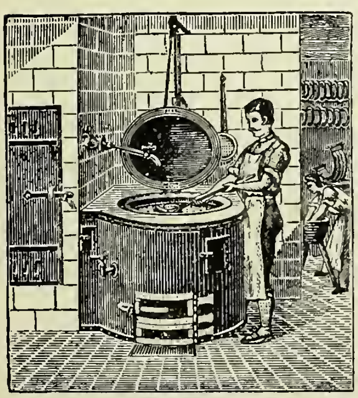
Baking Ovens—Pork Pie and Cake Making.

Pork Purveyor's Shop.*—Sausage and "small goods" making is, in the majority of cases, associated with pork purveying. In some instances beef purveyors also conduct this business, and there are a few factories which manufacture large quantities, these being sold to grocers and others for distribution to the general public. It is therefore necessary to consider what sort of place is necessary as a place of business.

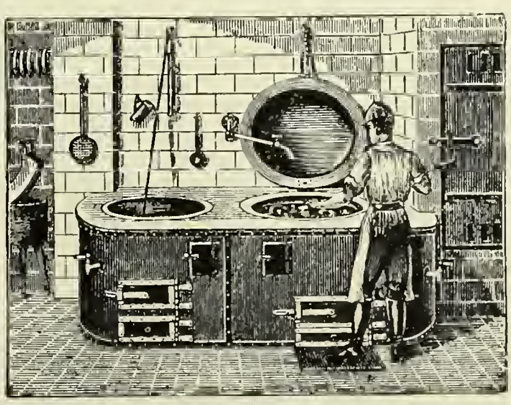
A Pork Purveyor's Shop.—The best design is to have the shop and work-room on the same floor, with a partition wall separating the two. Both should be square and high in the roof, giving plenty of freedom to hang the hams, etc. The window should always be a large sheet of plate glass if possible, and over it and above the entrance door should be iron gratings, always left open. A marble slab at the window is clean-looking in summer, and cooler than anything else, although glazed tiles are very often substituted. The slab should always slope somewhat, so as to display the goods. Overhead in the window recess should be brass rods, suspended from the ceiling, on which to hang hooks for supporting goods. The principal sorting table in the shop should also be of marble if possible, and should stand in the centre of the floor. At the corner, between wall and window slab, a square French or American block should be placed on which to chop pieces, and running alongside of the wall should be a broad shelf, of wood or marble, on which to conveniently keep pieces ready to hand. The rest of the space in the shop is usually left free so as to allow of the suspension of pigs from hooks placed on a strong steel rail going right round the shop. The roller hooks are best, as the carcase can be shifted right round to any position without any effort. There should always be in a fairly well-to-do shop one small set of scales, one medium size, and one beam scale. Good reliable tools—choppers, knives, saws, etc., are indispensable. Very often, when the purveyor can afford it, the appearance of the shop is much enhanced by having the floor inlaid with Mosaic tiles and the walls covered with glazed tiles. Both are easily kept clean.

It is needless to say that absolute cleanliness must be observed in every shop. All the marble slabs should be washed with soap and water every day. The plates in the window should be submitted to the same treatment, and brasses and steel surfaces polished up at least twice a week.

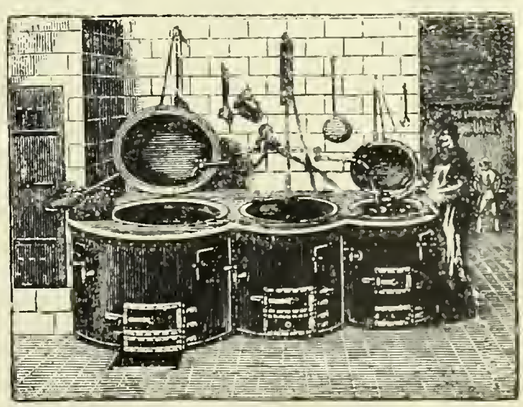
* From *The Manual of the Pork Trade*, now out of print.



Single Pan.



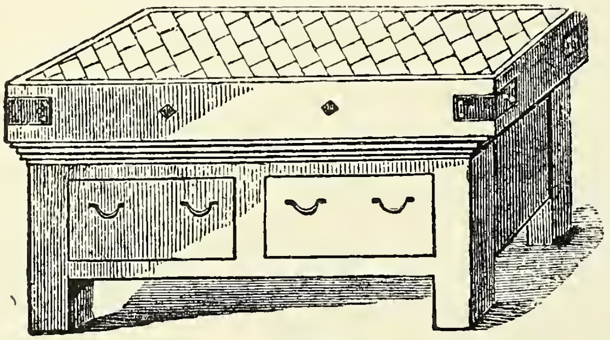
Double Pans.



Treble Pans.

Pork Purveyors Cooking Pans.

The Work-room is most convenient on the same floor as the shop, as it saves much labour in transferring goods to the shop for sale. The floor should be of cement, and gently sloped into a grating, either in the centre or at the side, so as to take away the washings and all the superfluous liquids. The tables are best disposed round the wall, on two sides, with one in the centre of the floor in close proximity to the chopping machine. On this table should be placed the filling machine, so that when exercising



French Block.

supervision over the chopping of the meat the filling of sausages may be going on at the same time. The side tables are used for cutting up the meat into pieces, about 2 in. square, before placing in the chopping machine. The windows should be large, and should also have open gratings on top, so as to create a draught right through the shop through the gratings in front. Here, as in the shop, the utmost cleanliness is necessary, and tables should be scrubbed daily, as also the chopping and filling machines. These latter should be washed immediately when out of use with scalding water, so as to clean them properly and prevent oxidation. Knives, choppers, steels, etc., should all be washed daily with scalding water. Baskets used for carrying sausages to any distance should never be used on return until scalded, as in transmission they are very liable to get dirty, and if kept about small shops are sure to be returned with fully developed germs of diseased meat adhering to the wicker-work.

The Cooking Room should be on the same floor as the others if possible, but need not be of the same size; a smaller room is quite equal to all requirements. The utensils of greatest importance required for it are the boiling pans. There should at least be two, one of 60-gall. capacity and one of about 30-gall.; and where steam is available they should always be jacketed, so that they can be heated by it. In lard-rendering, steam heating is very superior to fire heat, as the lard will be under very little risk of being burned or darkened in any way; whereas with fire heat the risk is very great indeed. But it is not always possible or practicable to have steam, in which case water-jacketed pans are the most serviceable. The plain copper or boiler heated by fire is at all times to be avoided, as the extra expense of fitting up water-jacketed pans is repaid many times over in the better quality of lard produced. The pans should be fitted up close to the wall so as to give a clear space in front, and running along the side of the opposite wall (supposing the room to be square or oblong) a shelf, 18 in. wide, running all the way, will be found very convenient. Amongst the general requirements are perforated ladles, long cooking forks, etc. It will be found very useful to have one or two ventilators, either in the roof or in the side walls of the cooking room, so as to permit the steam to escape. It is very essential to keep this department clean, and the coppers and shelves should be washed daily, as also the floor, which is best made of flagstones or cement, sloping into a general grating leading to the drains. A copious supply of water should always be at hand, and a small hose-pipe for distributing the water will be found very useful.

Smoke Oven.—Next in importance to the above arrangements is the smoke oven. It is most conveniently placed near the door of the cellars, and is usually a plain brick structure, made according to the amount of smoking to be done. Smoke ovens of a portable nature are made in various sizes.

The dimensions run from 6 ft. high, 2 ft. 6 in. broad, and 2 ft. 6 in. deep. The advantage of a small apparatus of this kind is that it can be freely moved about. The flue shown on top can be led into any chimney near at hand, or directly through the wall if no chimney is convenient. It is made entirely of sheet iron; but this apparatus is only suited to a small trade, and the necessities of a large trade must be met by building smoke ovens, usually of brick, although that is immaterial. All that is necessary is to provide a building about 6 ft. broad by 10 ft. high and 7 ft. deep. If larger space than this is sometimes required, it will be found much more advantageous to build a new oven alongside, of the same size, as it has been found by actual experiment that the best results are produced by limiting the space as indicated.

In every case the best material for producing the smoke flavour is oak dust, but where that is not easily obtainable ordinary wood shavings—always plentiful—is the next best thing. Pine wood should always be avoided. In the process of smoking hams or sausages, the object is to obtain on these goods a fine deposit of the tarry matter peculiar to wood, and known in chemistry as pyroligneous acid. If, therefore, this can be so manufactured as to be easily rubbed on the goods to be smoked, it follows that the necessity for smoking disappears.

Cellar.—The cellar is perhaps the most important part of a pork butcher's outfit, and requires a very large amount of care in construction. Wherever possible the entrance should be outside of the shop, and entirely cut off from the work-room or cooking room, so as to ensure the air being fresh and free from heat from these places. The best plan, where room is of value, is to have the cellar directly under the shop, the rafters supporting the floor being covered over, so as to form a ceiling either with ordinary match-boarding or sack-cloth. It will be found most convenient to arrange round the four walls—supposing the space is square, or nearly so—elevated platforms of stonework, solid, and cemented perfectly smooth on the top. The size of these should be 2 ft. high by about 3 ft. wide, and they should all be built on a gentle slope, so that the brine formed by the salt running from hams or bacon may easily run into a common channel. At one corner it will be found necessary to have a cistern for receiving this brine, the size of which will in every case be determined by the amount of space devoted to the platform. The brine so formed will be found very useful for replenishing the pickling vats. In the centre of the floor may be erected the pickling vats, and these are always best made of

polished slate, bolted and cemented together, or of hard Caithness flag-stones treated in the same manner. A very useful size of vat is about 4 ft. deep by 3 ft. 6 in. square. If it be possible to give a separate space to the brine vats, say, outside the cellar in underground premises, the centre of the cellar floor should be made into a large square platform, same height as the side tables, and of a size to allow of a clear footway between it and the side platforms all round.

General Arrangement.—The general arrangement of a pork purveyor's premises would, according to above, be as follows :—In front, the shop, and leading from it a doorway into the work-room, adjoining being the cooking room and smoke-house. Immediately below these would be the cellar and pickling vats.

Note.—In addition to the foregoing, modern requirements necessitate the adoption of a cooling room or refrigerator. The small refrigerating machines now made are inexpensive, and prevent much loss. The meat can be chilled before being cured, and kept cool during hot weather. Not only does this prevent loss, but it enables business to be more satisfactorily conducted.

Pork Ribs (to salt).—Use the ribs with about ½ inch of meat on them; rub well with salt, lay them one on top of the other, and let remain for one week. They can then be used either smoked or salted. Most of our best meats are spoiled by over salting, and again by using too much spice. Smoking meats does not preserve them, it merely saves them from destruction by flies and insects.

Pork Sausages.—These may be made in various ways, according to the price at which they are to be sold. They are rarely made of the pure meat, as when so made they are too rich and unpalatable. If, however, a large proportion of the meat used be lean the richness will to a great extent disappear. It is in all cases, however, advisable to have present some sausage meal, bread, or granulated rice, even if added only in small quantities, as by that means only, firmness can be obtained. The following recipé is for a first-class sausage :—

15 lbs. lean pork.
6 ,, fat pork.
2 ,, pressed bread.
2 ,, sausage meal.
14 ozs. seasoning ("No. 1 pork," or from recipé below.
2 ,, food preservative (dry antiseptic).
Rose pink colour (made into a paste) to tint required.

If the flavour of sage is desired, one ounce of rubbed sage leaves may be added to above.

Seasoning.—9 lbs. salt.
6 ,, ground white pepper.
½ ,, ground nutmeg.
½ ,, mace.

Small quantities of cloves, cayenne pepper, or ginger may be added to taste. A little rubbed basil also imparts a splendid flavour. The addition of a little ginger keeps the sausages from repeating.

The pork (lean and fat) is all cut with a hand knife into pieces about three inches square and thoroughly mixed together on a table. The pressed bread is then added, and the mixture put into the bowl of machine, if it is a silent or open bowl machine that is used, but should it be a close or Alexander pattern machine with screw propeller all the ingredients should be thoroughly mixed together on a table then put into the hopper, adding a little water as the cutting proceeds. With a silent machine the bread and meat are cut roughly first then the sausage meal and other ingredients are added. The whole mixture is cut to a very fine state, until the various ingredients become thoroughly mixed, and in such a condition as to present to the eye the appearance of a homogeneous mass. This process should only take a few minutes. The mixture is removed to a table or marble slab or meat trough, from which it is taken in double handfuls and thrown into the filling machine, from which it is filled into the casings.

Pork sausages are filled into pig casings, and should be linked six to the lb.

The quality of pork used must be very good; any part of the pig being used. Large pork is generally preferred, as it is much cheaper and firmer. A good ordinary sausage is made as follows :—

15 lbs. lean and fat pork and pork trimmings.
4 ,, pressed bread or scalded rice.
4 ,, sausage meal.
11 oz. No. 1 pork seasoning.
2 ,, food preservative (dry antiseptic).
2½ ,, rose pink colour.

If sage flavouring is desired, add one ounce of rubbed sage leaves.

In cases where makers prefer to compound their own seasoning, the following may be used :—

9 lbs. salt.
6 ,, ground white pepper.
½ ,, ground nutmeg.

to which should be added small quantities of cloves, cayenne pepper, or ginger.

Smoked Pork Sausage.—

15 lbs. lean and fat pork.
3 ,, Farina or other flour.
4 ,, sausage meal.
11 ozs. No. 1 pork seasoning.
2 ,, food preservative (dry antiseptic).
1 ,, saltpetre.
1 ,, smoke powder.
½ ,, sugar.

Those who prefer to compound their own seasoning may use the following :—

9 lbs. salt.
6 ,, ground white pepper.
½ ,, ,, nutmeg.
1 ,, ,, corianders.
½ oz. cayenne.

to which may be added small quantities of cloves or ginger.

The pork is cut up into pieces about three inches or so square and mixed on a table. The pressed bread is added and mixed with the pork. The mixture is then placed in

the machine, and after being cut somewhat the sausage meal is added dry. Should the mixture become stiff, water is added until the required consistency is obtained. The seasoning and other ingredients are then added, and the whole chopped very fine. Fill into wide pig casings and hang in the open air for an hour in order that they may dry and get firm, then place in smoke stove for three hours and cook for thirty minutes at 180° Fahr. Previous to sending them out rub them with a cloth into which has been dropped some salad oil.

Saltpetre is added to impart flavour and also to heighten the colour during cooking. It should be used in a finely powdered state.

Smoke powder is essential to all smoked sausages which are not smoked for an extended period. The flavour can only be attained by this means.

Wiltshire Prime Pork Sausages—

24 lbs. lean pork.
8 ,, fat pork.
5 ,, pressed bread.
1 ,, sausage meal.
10 ozs. salt.
4 ,, ground white pepper.
$\frac{1}{4}$,, rubbed sage.

The appearance is very much enhanced by the addition of some rose pink colour.

Pork Sausage (*German Recipé*).—Take 11 lbs. of streaked bacon and chop it fine, seasoning with $4\frac{1}{2}$ oz. salt, $\frac{3}{4}$ oz. ground pepper, and $\frac{5}{8}$ oz. allspice, and then mix the paste with from 16 to 24 oz. of milk. Stuff into narrow pig skins or wide sheep skins, and twist off into short lengths.

Pork Sausage.—16 lbs. pork.
5 ,, fat.
7 ,, bread.
4 ,, pansitose.
1 ,, No. 1 seasoning.
2 oz. dry antiseptic.

Extra Pork Sausage.—Take lean meat—shoulders are the nicest—add from one-third to one-half more of fat meat, according to taste. Chop the whole fine, adding 2 lbs. of salt to 100 lbs. of meat Season to suit—20 ozs. of seasoning in 100 lbs. of meat giving the best results. Stuff in narrow hog casings—not too tight. If the sausage is to be used immediately, a very little cardamom and ground lemon peel will add to the flavour. Potato flour is often used in pork sausage. Preservative should be added when the sausages are to be kept for any time.

Pork Cervelat Sausage.—From a young hog take 70 lbs. lean meat, 30 lbs. fat meat, chop fine and mix with 31 oz. salt, 3 oz. pulverised saltpetre, 6 oz. ground white pepper, $1\frac{1}{2}$ oz. whole white pepper. Stuff tightly in hog bungs or beef middles. Hang in a cool place from eight to twelve days, then smoke six to eight days. Should the sausage become white in the course of time, it can be cleansed with a woollen cloth dipped in lard. In winter they may be kept from four to six weeks without being smoked. If made of coarsely chopped meat, they will remain juicy much longer than otherwise.

Pork Sausage—Use one-third fat and two-thirds lean pork, chop fine and add 9 oz. of salt, $4\frac{1}{2}$ oz. ground pepper; if for immediate use, add a little cardamon and lemon peel. Stuff in narrow hog casings. Tie in links containing 4 oz. of meat.

Pork Sausage.—16 lbs. pork.
5 ,, fat.
7 ,, bread.
3 ,, sausage meal.
9 oz. salt.
3 ,, pepper.
1 ,, rubbed sage.
2 ,, dry antiseptic.

Pork (Stuffed Leg).—When a pig's leg is to be stuffed care must be taken in the killing to have it properly cleaned, and not to have it all cut into. The legs must be cut off as high up as possible. Then the skin is to be drawn off them down to the claws, which are to remain on. Lay for a day in brine, and then for quarter of an hour in lukewarm water, and then dry with a cloth. Sew the top opening up till there is only space enough at the socket of the leg to admit the sausage stuffer. Then make a stuffing of veal and pork, the latter to be well washed. Take $5\frac{1}{2}$ lbs. of each, and chop very fine, adding the following spices:—5 oz. salt, 1 tea-spoonful of saltpetre, $\frac{3}{4}$ oz. ground pepper, $\frac{1}{6}$ oz. ground ginger. Work all together with water. Then fill the legs with the stuffing, using the sausage stuffer. Fill very tight, and sew up the small openings very close. Boil slowly for half or three-quarters of an hour, and take out and lay on a table until perfectly cold.

Pork to Corn.—see Corn Pork.

Portable Boilers.—see Boiling Pans.

Portable Smoke Stores.—see Smoke Stores.

Potato Chipping Machine.—see Chip Potato Machine.

Potato Flour.—see Farina.

Potato Peelers.—Seeing that potatoes form such an important item in the food supply of nearly all civilised countries, it is a matter of surprise that improvements in the matter of their preparation for the table have been so long delayed. Careful housewives and those in charge of our large institutions have always complained of the enormous waste in peeling. It is not an exaggeration to say that at least half of the peelings usually thrown away might be saved, even when peeled by hand, had care been used. Those who see large quantities peeled are aware of the difficulty. Speed and care do not go hand in hand in the matter of potato peeling any more than in many of the other duties in life. It is a dreary task at the best, and is nearly always delegated to those who have little interest in saving. One-fifth of the potatoes have been called peelings. This waste is a very important item, much more so than it seems at first, when the figures are worked out in pounds, shillings, and pence.

A machine that will reduce waste to a fraction, and do four hours work in one, is worthy of consideration, and Fig. I. represents such a machine.

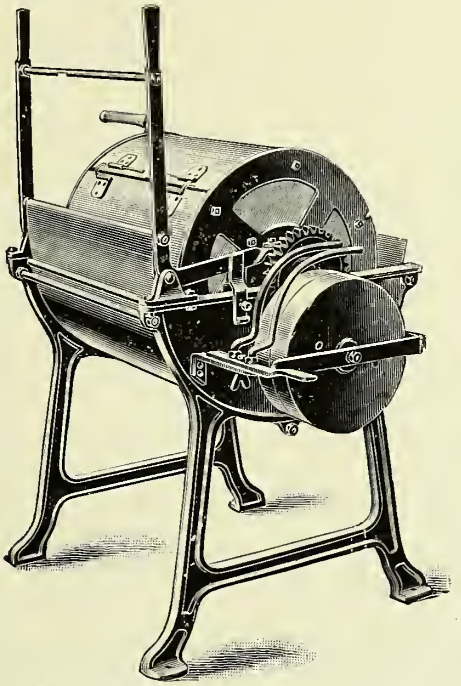


Fig. I.—Potato Peeler, for hand or power.

The working instructions of these potato peeling machines are as follows:—The revolving barrel is lined inside with stabbed metal; into this barrel put the potatoes being careful not to overload it. The barrel must be not quite half full. The potatoes are put in just as you receive them from the dealer, with all their native soil. It will be found a good plan to let them stand in water some time before beginning to work the machine. The trough must contain water in quantity to just cover the barrel, say 2 or 3 inches. Turn the handle for ten minutes at about 60 turns to the minute.

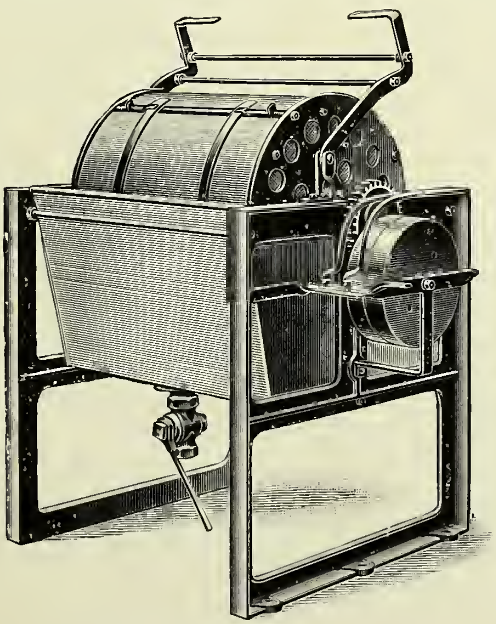


Fig. II.—Potato Peeler, for power.

The power machines are what are usually fitted into large restaurants and hotels, and do the work most expeditiously. Several important improvements have recently been made in these machines.

The barrel is constructed on an altogether new principle, six swinging doors compose the outside. As the barrel revolves, they are always open when at the top, and closed when at the bottom. This is brought about by gravitation together with the weight of the potatoes. It therefore follows, the potatoes cannot get out, as their own weight closes the barrel.

The water trough is provided with a well, and the outlet is on either side of the machine. In this well the dirt and peelings settle, so that they may be more easily removed. Settling as they do in this well they are not being constantly beaten up by the revolving barrel, and mixed with the potatoes, and choking up the perforations. Especially does this apply where more than one filling of potatoes are done in the same water; in fact, the well has made it possible to do many more lots in the same water than formerly. The frame of the machine may be built square, in order that it may stand against the wall, and it is provided with bolt holes, to screw to the deck of a steamer. By this arrangement space is saved, without reducing the utility of the machine. In the barrel the advantages gained from this principle are many. There is no door opening out, no fastenings are required, such as spring, lock, bolt, etc.; no loose parts to get lost. Wherever the barrel is stopped the potatoes may be put in, because all the top doors fall in as the barrel revolves. To remove the potatoes, revolve the barrel in the opposite direction. The barrel revolves after the manner of a paddle wheel, but instead of throwing the water out, the water is thrown in. By this means water is continually being forced through the potatoes, removing the dirt and peeling, making the life of the perforations longer. There can be no bumping or bruising of potatoes; and as the doors overlap one another, there is no space lost, the whole of the barrel is a peeling surface.

Potted Head.—(1). For this, take tenderly cooked pigs' rind or boiled calves' feet, sinews, etc., or oxen feet. The latter require to be *very* finely chopped.

(2). Salted boiled heart, the calf of the leg of a bullock, or scraps of boiled ham or pickled meat, salted pig's head, snout, ears, cheek, or rind.

Take, say one-third of that under heading (1) and two-thirds of that under (2), and chop the size of hazelnuts. Stir in some strong stock. Now season: to 40 lbs. of meat take $1\frac{1}{2}$ lbs. salt, 3 oz. white pepper, 3 oz. coriander, $\frac{1}{4}$ oz. grated nutmegs, $\frac{1}{4}$ oz. onions. Mix well, and fill into pigs' stomachs three-quarters full. Put them into boiling water, and boil according to the thickness, one, to one and a quarter hours. When they are boiled, wash them and then let them cool, turning them often, but shaking and pressing them as little as possible.

Potted Head.—see Swiss Potted Head.

Potted Meats in Jars.—Potted meats can be put up in an almost endless variety of meats too numerous to classify, but the method, in each or any particular meat selected, is similar.

The meats should first be cooked till tender, allowed to cool, all bones and sinews removed, and chopped fine, then beaten to a paste in a marble mortar—adding, by degrees, a little melted fat, pepper, allspice, cloves, or such spices as may be best suited to the meats being prepared—press tightly into pots, so as to force out all air, and cover with a layer of clarified butter or pure mutton fat, $\frac{1}{4}$ in. thick, cover, and keep in a cool place.

Poultry Imports.—see Egg and Poultry Imports.

Poultry in Victoria.—see Victoria (Australia).

Powder Distributing Bellows.—see Bellows for Distributing Powder.

Preservatives.—see Food Preservative and Bi-Sulphite of Lime.

Preserved Beef.—To 100 lbs. of beef add 6 lbs. salt, 2 ozs. saltpetre, 2 table-spoonfuls of soda, 2 lbs. sugar, 4 gallons water, mix well together. Sprinkle the bottom of the barrel with salt, put in the beef, with a very little salt between each layer, pour over the brine, and put on a weight to keep well covered.

Preserving Beef, etc.—It is always desirable to have oak tubs for the purpose of pickling beef, as they are easily handled and do not impart any flavour to the meat. Another requisite is a pickle pump. Beyond these, the requirements are a sufficient supply of salt, dry antiseptic, pure cane sugar, pure saltpetre, a mixture of coriander seed and juniper berries—this latter being used for giving a piquant flavour to the meat. When satisfied as to the quantity of pickle necessary, proceed to make it as follows:—

55 lbs. salt.
5 „ dry antiseptic.
5 „ saltpetre.
5 „ pure cane sugar.

Make the whole of this up to 20 gallons with pure water, and, if it is not clear, boil the pickle and skim it until it is. Put this into the pickle tub, so that there will be a sufficient quantity to immerse the meat in. Before putting the meat in, however, some of the same pickle should be injected all through the meat by means of the pickle pump referred to. When the meat has been put into the pickle, put a circular boarding on the top, so as to keep the meat in the pickle; the cure or pickling will be complete in about seven or ten days. In every tub of pickle there should be placed a bag containing 3 to 4 lbs. juniper berries and coriander seed. This gives a piquancy to the meat.

Preserving Pickle.—The antiseptic in above pickle preserves it, but in time the pickle will get charged with blood which exudes from the meat. All that is then necessary is to boil the pickle, and the organic matter will either rise to the surface, where it can be skimmed off, or will precipitate to the bottom, where it will settle.

The pickle should always test on salinometer 100°; and if at any time the strength falls below this, ingredients, in the proportions named above, should be added.

Pressed Sausage (Presswurst).—Take 5 lbs. streaked pork from fore-leg, which has been in a salt pickle with salt, saltpetre, and cane sugar, 10 lbs. snout, ears, etc., 3 lbs. salted pigs' tongue.

Cut these all *evenly* into pieces like beech-nuts. Now add 5 lbs. salted rind of pork, made very tender, and some boiled calves' feet without bones, both chopped like peas, and salt the whole to taste. The whole should be well worked together with 2 quarts of very strong stock. Then season with $1\frac{1}{2}$ oz. white pepper, $\frac{1}{2}$ oz. nutmeg, $\frac{1}{2}$ oz. ground coriander, 3 ozs. eschalots, grated and salted. Work this all well together, and fill *not too full* into pigs' stomachs, and let them simmer according to size from one hour and a-half to one hour and three-quarters: they should be turned pretty often. This pressed sausage should be sold fresh, but if it is necessary to keep some a few days, smoke in *cold* smoke.

Press for Beef, Bellies, and Briskets.—see Beef Press.

Press for Bread.—see Bread Press.

Presses for Lard.—see Lard Presses.

Prices of Fat Cattle (Live Weight).—see Live Stock Returns.

Producer (Gas).—see Gas Producer.

Provisions in Cape of Good Hope.—see Cape of Good Hope.

Puddings.—see Black Puddings, also White Puddings.

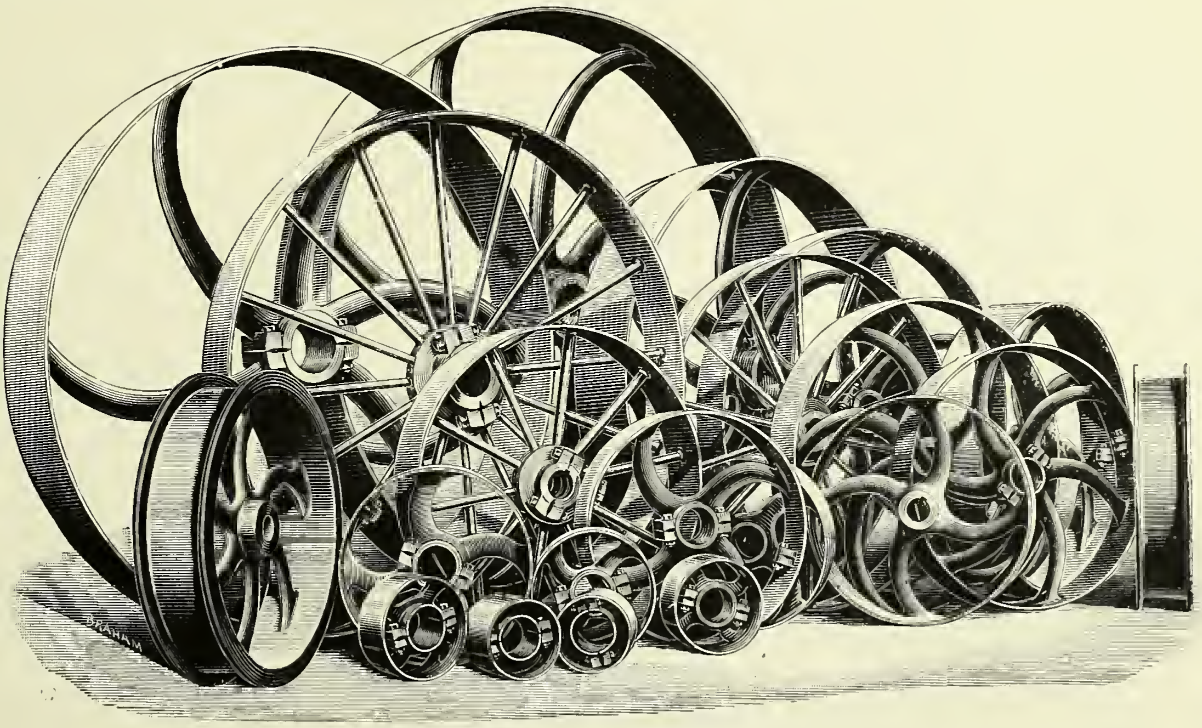
Pulley Blocks.—see Hoists.

Pulley or Rigger.—The pulley or rigger is a wheel fixed on a shaft or machine, for transmitting power by means of a belt, hand rope, or chain. Where a belt is used as the means of transmission, the periphery consists of a turned, flat, or convex surface, the latter being useful in keeping the belt to the centre of the pulley when working. For a rope drive, **V** pulleys are used, *i.e.*, instead of a flat or convex surface, a **V**-shaped space is formed on the periphery for the rope to run in. For a chain drive, the sprocket wheel, with teeth at intervals all round the edge, is used; and sometimes for a belt drive the pulley has flanges, but these are not common now-a-days. Pulleys are either solid or split. The solid pulley is cast all in one piece, and must be driven on from the end of the shaft. In a number of cases this is inconvenient, as it is troublesome to take a line of shafting to pieces, and the split pulley has come very much into use. It is a pulley made in two halves, which are bolted together over the shaft. Pulleys are most commonly made of cast iron, but they are now made also from wrought iron and from wood, the latter lasting well, and having the advantage of cheapness. Where great power is to be transmitted, belting is mostly employed, but frequently very large factory engines convey their energy to the main shafting by a series of ropes placed close to one another on multiple grooved pulleys; but the great use of the rope drive is for transmitting power round corners or at angles, and in other complicated positions. The chain pulley is used in certain special drives. The belt drive is by far the commonest, and on the whole is a facile and economical method of transmitting power.

Pumps.—There are many varieties of pumps, such as reciprocating, plunger, piston, or double-acting bucket, etc. Among the *desiderata* required for pumps, the following are practically general for all. They should have a good efficiency under varying conditions of speed and work; they should run free from noise and shocks, and require few repairs.

In reciprocating, piston, and plunger pumps the continual change of direction of the water in and out of the pump chamber acts disadvantageously against any great piston speed. If the piston be supposed to be moving with a quick speed, the difference of pressure between the pump chamber and the outside source of supply would be greater than if it were moving with a slow speed. This difference of pressure would vary approximately as the square of the speed. In a piston pump, if the piston were supposed to be connected similarly as the steam piston is to a shaft, rotating uniformly, the piston speed would vary from nothing at the commencement of the stroke to a maximum towards the middle of the stroke, and this maximum would be shown to be approximately half as much again as the average speed. This applies equally to plunger or bucket pumps. Should the valves be at some distance from the pump chamber, a volume of water in the passages would be set in motion in opposite directions every double stroke, and this to no useful purpose. To avoid this it is advisable, and might also be stated as an axiom, that there should be as little clearance as possible between the pump chamber and the valve.

Rotary pumps are those in which the necessary action is produced by the revolution of segmental pistons around their axis. There being no valves or springs to get out of order, they possess advantages over ordinary reciprocating pumps, as an even flow can be maintained without shock or impulse. The "Douglas" rotary pump is one of the best type, and consists of an outer casing with only one cover, in which revolves a perfectly balanced plate carrying three equi-distant projections which act as pistons, and revolve in an annular space provided for them by a crescent-shaped projection on the cover. It will thus be seen that in operation the pistons become liquid-packed, and therefore tight under any pressure. The only other moving part is the abutment disc, which revolves on a fixed centre, and is formed with two cavities which house or conceal each of the pistons in turn as they revolve, while passing from the delivery to the suction side of pump. The surfaces which come in contact with each other are very large, and therefore reduce the slip to the smallest minimum.



Pulleys of Various Sorts and Sizes.

Owing to its compactness, portability, and capacity, the rotary pump is found most useful in all classes of work where an even flow is necessary. These pumps can be driven by any form of motor, gas or steam engine, either direct or by belt, or can be coupled to an electric motor, in which case special raw-hide spur wheels should be used in the intermediate for bringing down the speed.

Queensland.—The following information is taken from the Report of the Registrar-General on Agricultural and Pastoral Statistics of Queensland for 1899:—

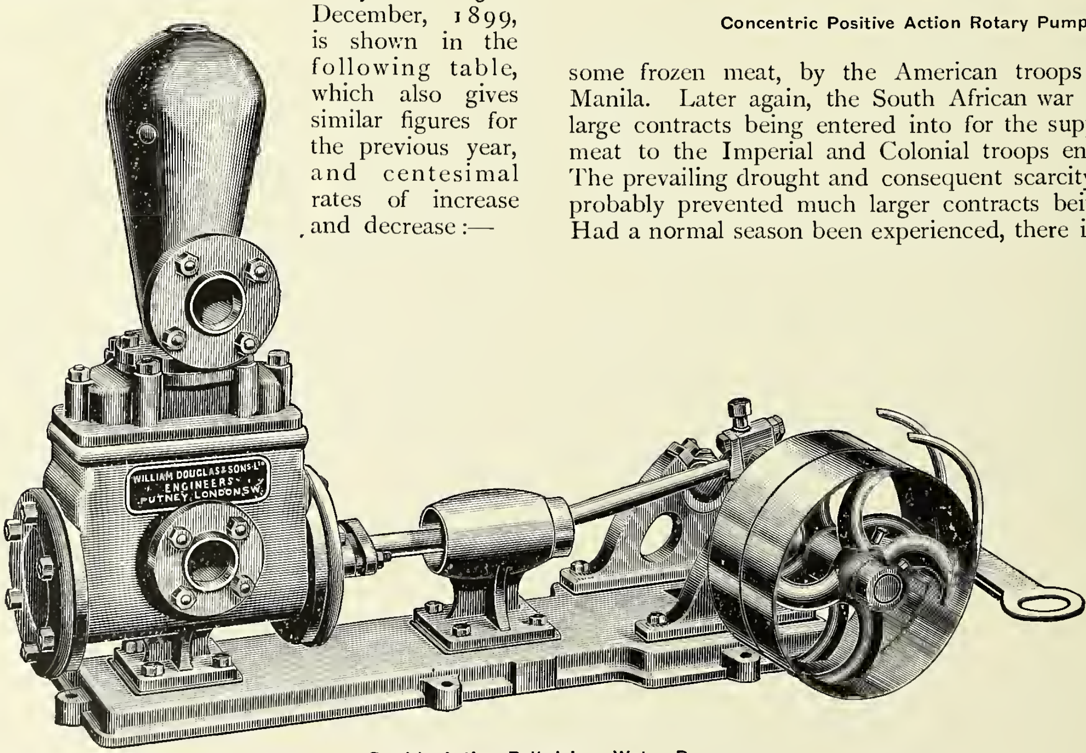
Live Stock.—The report on the above heading for this year is not of a progressive or encouraging nature, inasmuch as it records considerable decreases in the three great lines—viz., horses, cattle, and sheep; pigs alone showing an increase, as compared with the figures of last year. Drought of almost unprecedented severity has held sway in the Western portion of the Colony for many months, causing

death and destruction to all classes of stock, and corresponding losses to owners. Whilst the land over this drought-stricken section of the Colony is, for the most part, of the best quality, and with the smallest rainfall is ever ready to respond with abundance of grasses and herbage, yet with an entire absence of rain vegetation is impossible.

This country is wanting in natural permanent water, as a rule, and large sums have been spent by the pastoral lessees in its conservation; dams, tanks, and artesian bores having been made at great expense to utilise portions not naturally provided with a permanent water supply, and much country, otherwise waterless, has been rendered available in this way.

The absence of moisture in the atmosphere at ordinary times converts the natural grasses into hay, which retains its nutritive qualities for a very long time, so that the flocks and herds do not suffer to any great extent so long as the dry feed remains available. Bush fires, however, are apt to rise and sweep away all provision for the future, and whilst cattle are fairly safe from the fire itself, sheep frequently fall victims to the flames.

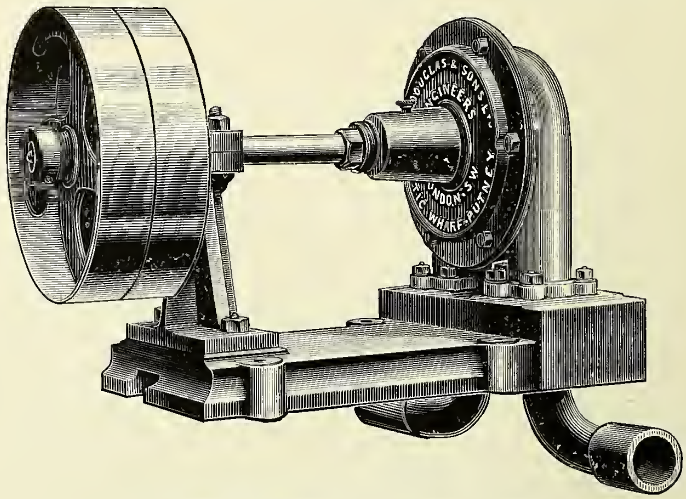
The number of live stock in the Colony on the 31st December, 1899, is shown in the following table, which also gives similar figures for the previous year, and centesimal rates of increase and decrease :—



Double Acting Belt-driven Water Pump.

Year.	Horses.	Horned Cattle.	Sheep.	Pigs.
1898 - - - - -	480,469	5,571,292	17,552,608	127,081
1899 - - - - -	479,127	5,053,836	15,226,479	139,118
Numerical Increase in 1899	...	...	...	12,037
Numerical Decrease in 1899	1,342	517,456	2,326,129	...
Centesimal Increase in 1899	...	...	...	9·47
Centesimal Decrease in 1899	0·28	9·29	13·25	...

Live Stock Slaughtered.—One great outlet for meat is now found in the export trade. The Spanish-American war led to large quantities of tinned meats being required, besides



Concentric Positive Action Rotary Pump.

some frozen meat, by the American troops engaged at Manila. Later again, the South African war led to some large contracts being entered into for the supply of tinned meat to the Imperial and Colonial troops engaged there. The prevailing drought and consequent scarcity of fat stock probably prevented much larger contracts being obtained. Had a normal season been experienced, there is no doubt a very large proportion of the available fat stock in the country would have found its way to South Africa in various forms instead of dying on the runs.

The numbers of cattle and sheep slaughtered for profit was, for 1899, 640,898 cattle, and 1,497,546 sheep (live animals exported being excluded); of these 386,466 cattle and 479,818 sheep were treated at the various meat works, being either preserved, frozen, or boiled down. Carcases used for making extract are included in those boiled down. These figures show a considerable advance on those for the previous years, but not nearly what they would have done had the season been a good one.

In cattle, there were 140,815 preserved during 1899 against 65,966 head in 1898; also 117,668 head frozen in 1899 against 112,940 head in 1898, and 127,983 boiled down in 1899 against 147,528 head in 1898.

In sheep, there were 144,345 preserved in 1899 against 69,006 in 1898; also 119,964 frozen in 1899 against 61,258 in 1898, and 215,509 boiled down in 1899 against 146,845 in 1898.

The following table gives the values and outputs of each class of establishments for 1899:—

No. of Establishments.	Kind of Establishments.	No. of Hands Employed.	Value of Machinery and Plant.	Value of Land and Premises.	Value of Output.
			£	£	£
9	Bacon Curing -	185	13,686	18,233	136,244
25	Boiling Down -	725	110,773	73,778	526,489
13	Meat Preserving	2,246	192,415	351,188	1,607,613
47		3,156	316,874	443,201	2,270,346

Forty-seven establishments were in active operation in 1899 for slaughter and treatment of animal products—viz., thirteen meat works, twenty-five boiling down, and nine bacon factories; eleven establishments, whose output is principally extract of meat, being included with the boiling down. None of the places are counted twice this year, but are alloted to the division to which they belong without being counted again in another branch.

The number of hands employed in 1899 was 3156, against 2876 in 1898.

These establishments are equal to a much larger output than obtained in 1899, when many were closed down for some months.

Extract, Tallow, Etc.—The quantity of extract produced in 1899 was 1,925,193 lbs., against 1,593,285 lbs. in 1898, showing a great advance on any previous year.

The quantity of tallow produced in 1899 was 19,165 tons, against 13,609 tons for 1898.

Lard for 1899 was returned at 222,460 lbs., as against 216,194 lbs. for 1898.

By-Products.—Edible fats for 1899 were returned at 985,121 lbs., against 1,083,523 lbs. for 1898.

The weight and value of manure has increased for 1899 by 2275 tons and £20,313 in value; hides, by 69,996 in number and £110,756; skins increased in 1899 by £57,280; bones, by £1678; hoofs and horns, by £5204; hair, by £488; oil was smaller in quantity, and decreased in value by £68. The total for all by-products for 1899 was £526,928, against £332,303 for 1898.

Wool.—Wool has decreased considerably in quantity exported, the falling off in weight of that produced in the Colony being 15,692,976 lbs. as compared with that of 1898. It may be, as frequently obtains in times of drought, that some of the wool, at all events, remains on the stations, teams not being able to travel through want of water on the roads; but of this I have no certain information. The quantity of wool produced elsewhere, and sent for shipment through this Colony, shows an increase for last year, as compared with the previous one of 17,352 lbs.

Bacon.—The Registrar-General's Report for 1899 gives the following information:—

With a large increase in the number of pigs in the Colony for 1899 as against the previous year, it follows that there would be a greater number killed for profit, and accordingly we find the number of pigs returned as slaughtered for 1899 to be 101,704 as against 85,482 for 1898. These figures do not by any means give the total number of pigs slaughtered in the Colony, but were collected on a similar basis to the collections of previous years, and include pigs killed at factories and by farmers, but not those killed by butchers.

The quantity of fresh pork is greater for the past year, being 773,701 lbs. against 674,271 lbs. for the previous year. Whilst salt pork is slightly less, the quantity of bacon and ham produced has increased in 1899 by 174,753 lbs. as compared with the previous year.

The table given under shows the numbers and quantities for certain Petty Sessions Districts, with comparative totals for the two years 1898 and 1899:—

Petty Sessions District.	Pigs Slaughtered.	Fresh Pork.	Salt Pork.	Bacon & Hams.
	Number.	lbs.	lbs.	lbs.
Allora - -	343	2,413	9,682	29,854
Beaudesert - -	333	785	820	35,040
Biggenden - -	239	12,785	450	12,478
Brisbane - -	51,464	81,840	14,130	4,045.800
Bundaberg - -	516	7,583	5,459	46,664
Crow's Nest - -	219	330	1,190	29,390
Esk - -	305	1,091	3,441	37,164
Gatton - -	593	3,400	8,799	63,572
Gympie - -	767	24,509	6,076	42,371
Harrisville - -	872	1,875	8,022	64,508
Highfields - -	424	435	225	54,131
Ipswich - -	942	39,781	4,237	21,926
Killarney - -	206	1,144	310	25,753
Laidley - -	483	3,125	5,680	66,310
Logan - -	1,327	52,692	20,797	55,795
Marburg - -	308	3,385	1,400	45,539
Maroochy - -	271	6,414	2,677	26,702
Maryborough -	1,803	28,685	11,327	142,988
Nanango - -	433	2,007	80	38,459
Rockhampton -	3,759	60,078	11,879	75,045
Roma - -	311	3,490	780	33,915
South Brisbane -	15,679	28,605	530	1,193,015
Tiaro - -	972	64,465	4,530	45,725
Toowoomba - -	5,162	3,380	6,160	529,537
Warwick - -	1,302	66,754	2,700	80,682
All other Districts -	12,671	272,650	70,220	305,397
Total, 1899 -	101,704	773,701	201,601	7,147,760
,, 1898 -	85,482	674,271	204,630	6,973,007

The quantity and value of bacon and ham imported and exported during 1899 is less than that of 1898. The following table contrasts the years 1898 and 1899:—

		Imports. lbs.	Imports. £	Exports. lbs.	Exports. £
1899	Pork - -	729	15	12,081	223
	Bacon and Hams	15,491	597	1,028,060	31,090
	Total - -	16,220	£612	1,040,141	£31,313
1898	Pork - - -	352	8	10,405	250
	Bacon and Hams	24,693	899	1,097,157	32,233
	Total - -	25,045	£907	1,107,562	£32,283

The conversion of pork into bacon and ham has, through the agency of artificially-produced cold, established pig-keeping on a scale much larger than it could possibly have attained by any other means. With the increase of dairying, a large food product in the shape of skimmed milk at once became available. No better food can be found for pig-rearing than this, and, supplemented by farm products with grain for fattening, the best quality of bacon can be produced.

The bacon and ham now produced in Queensland is of first-class quality, and although importations of this food stuff have not wholly ceased, they are insignificant in quantity and value compared with what is exported.

As dairying and pig-keeping seem to be kindred industries and run together, an expansion of the former in this Colony is almost certain to be accompanied by a greater number of pigs being kept.

Cheese.—This branch of the dairying industry, as shown by the Registrar-General's Report, had not made very great progress in Queensland during 1899, the number of producers having fallen to 221 against 234 in 1898.

The quantity of milk used in cheese-making increased from 1,772,089 gallons in 1898 to 1,911,214 gallons in 1899; whilst the amount of cheese produced increased from 1,843,803 lbs. in 1898 to 1,910,300 in 1899.

The greatest cheese-producing centre in the Colony is Toowoomba with 614,745 lbs., followed by Warwick with 395,001 lbs., Esh comes next with 159,143 lbs., Tiaro with 130,275 lbs., and Harrisville with 126,790 lbs.

Throughout the Colony the average is one gallon of milk to make one lb. cheese. The export of cheese in 1899 was 11,358 lbs. The consumption of cheese in Queensland is about 4 lbs. per annum for each inhabitant.

RACK for Cooling.—see Cooling Rack.

Rails.—see Bars.

Raisin Liver Sausage.—see Liver Sausage.

Raisin Seeder.—This is an easily adjustable machine for taking the seeds out of raisins. It is fitted with a regulating device for taking any size of raisin, and is very simple in construction. The fruit is fed into the hopper in a wet condition immediately after being washed, and by simply turning the handle the seeds are pressed out and ejected from the front of machine while the raisins fall down into a receiver below.

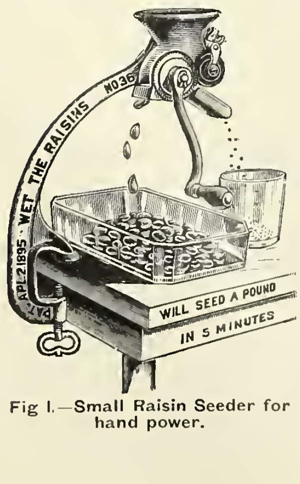


Fig I.—Small Raisin Seeder for hand power.

The directions for use issued by the makers are as follows:—

1. Be sure that the rubber roller turns freely on its shaft and is placed moderately tight against the toothed cylinder by adjusting thumb-screw. If too much pulp adheres to the seeds the rubber roller is not tight enough against the cylinder.

2. To clean machine, slacken thumb-screw and turn crank backward and forward under a stream of water, then place it in a position to dry.

3. The hopper must not be filled. The raisins should be sprinkled in the hopper as fast as the roller will grasp them. In the No. 36 the best results will be obtained by feeding them one at a time.

4. When not in use relieve rubber roller from pressure.

5. If saws and fingers stick together, loosen by steaming.

There are large power machines which seed up to 400 lbs. per hour, and which are largely used by wholesale fruit merchants and cake manufacturers. Being more elaborate in design we give the directions for working, as it is hardly necessary to say that good results can only be obtained by working the machine properly.

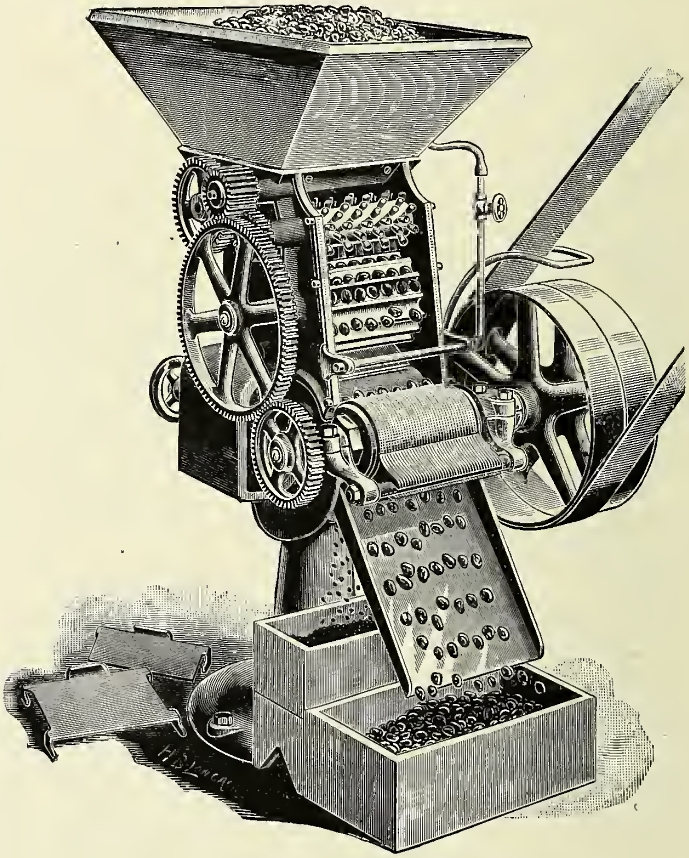


Fig. II.—Power Raisin Seeder.

Set up the machine to run at the speed and in the direction marked on the driving pulley. Connect the small upright pipe at the front of the machine to a water supply. Carefully oil all bearings, especially those of the rubber cylinder shaft. The machine is now ready for operation. Turn on the water freely into the sprinkler pipe which runs across the front of the machine and shift the belt on to the tight pulley. After the machine has run several minutes, reduce the flow of water to a dripping, and let the machine continue to run until the larger part of the water remaining on the saw discs (or pin cylinder) has dripped off. Then, with the hand wheel at the back of the machine, set the rubber roller against the saw discs (or pin cylinder). Throw a handful of raisins into the hopper and note their condition when they drop out of the spout. If the raisin is torn the pressure of the roller is not sufficient and the hand-wheel must be screwed up tighter. If the seeds have much meat

on them the same thing is true. If broken seeds are found in the raisins, the rubber roller is up too tight and must be eased off a little. This matter of pressure is one that will have to be learned by experience, therefore some little experimenting must be done. As soon as the raisins come through without being torn, and the seeds are whole and clean, sprinkle water over the sides and bottom of the hopper and fill it with raisins. While the machine is in operation allow the water to drip slowly. Before each refilling of hopper sprinkle with sufficient water to moisten the sides and bottom.

To renew the rubber roll unscrew the hand-wheel at the back of the machine until it no longer draws back the slide. Then take hold of the slide and pull it back off the machine. Two capped bearings will then be seen which contain the ends of the roller shaft. Take off the caps, lift out the roll and drive the shaft out of the iron spool, being careful to drive on that end of the shaft where no key can be seen. Place the shaft in the new roller and replace the parts in the condition originally found.

To renew broken saw discs, take out the screw from the gear end of the main shaft. Pull off the gear. Take out

READY RECKONER.

Per lb.	Per London Stone of 8 lbs.	Per Imperial Stone of 14 lbs.	Per Score of 20 lbs.	Per Cwt.	Per Ton.	Per Lb.	Per London Stone of 8 lbs.	Per Imperial Stone of 14 lbs.	Per Score of 20 lbs.	Per Cwt.	Per Ton.
D.	S. D.	S. D.	S. D.	S. D.	£ S. D.	S. D	S. D.	S. D.	S. D	S. D.	£ S. D.
1/16	½	⅞	1¼	7	11 8	10¾	7 2	12 6½	17 11	100 4	100 6 8
⅛	1	1¾	2½	1 2	1 3 4	11	7 4	12 10	18 4	102 8	102 13 4
3/16	1½	2⅝	3¾	1 9	1 15 0	11¼	7 6	13 1½	18 9	105 0	105 0 0
¼	2	3½	5	2 4	2 6 8	11½	7 8	13 5	19 2	107 4	107 6 8
5/16	2½	4⅜	6¼	2 11	2 18 4	11¾	7 10	13 8½	19 7	109 8	109 13 4
⅜	3	5¼	7½	3 6	3 10 0	1 0	8 0	14 0	20 0	112 0	112 0 0
7/16	3½	6⅛	8¾	4 1	4 1 8	1 0¼	8 2	14 3½	20 5	114 4	114 6 8
½	4	7	10	4 8	4 13 4	1 0½	8 4	14 7	20 10	116 8	116 13 4
9/16	4½	7⅞	11¼	5 3	5 5 0	1 0¾	8 6	14 10½	21 3	119 0	119 0 0
⅝	5	8¾	1 0½	5 10	5 16 8	1 1	8 8	15 2	21 8	121 4	121 6 8
11/16	5½	9⅝	1 1¾	6 5	6 8 4	1 1¼	8 10	15 5½	22 1	123 8	123 13 4
¾	6	10½	1 3	7 0	7 0 0	1 1½	9 0	15 9	22 6	126 0	126 0 0
13/16	6½	11⅜	1 4¼	7 7	7 11 8	1 1¾	9 2	16 0½	22 11	128 4	128 6 8
⅞	7	1 0¼	1 5½	8 2	8 3 4	1 2	9 4	16 4	23 4	130 8	130 13 4
15/16	7½	1 1⅛	1 6¾	8 9	8 15 0	1 2¼	9 6	16 7½	23 9	133 0	133 0 0
1	8	1 2	1 8	9 4	9 6 8	1 2½	9 8	16 11	24 2	135 4	135 6 8
1¼	10	1 5½	2 1	11 8	11 13 4	1 2¾	9 10	17 2½	24 7	137 8	137 13 4
1½	1 0	1 9	2 6	14 0	14 0 0	1 3	10 0	17 6	25 0	140 0	140 0 0
1¾	1 2	2 0½	2 11	16 4	16 6 8	1 3¼	10 2	17 9½	25 5	142 4	142 6 8
2	1 4	2 4	3 4	18 8	18 13 4	1 3½	10 4	18 1	25 10	144 8	144 13 4
2¼	1 6	2 7½	3 9	21 0	21 0 0	1 3¾	10 6	18 4½	26 3	147 0	147 0 0
2½	1 8	2 11	4 2	23 4	23 6 8	1 4	10 8	18 8	26 8	149 4	149 6 8
2¾	1 10	3 2½	4 7	25 8	25 13 4	1 4¼	10 10	18 11½	27 1	151 8	151 13 4
3	2 0	3 6	5 0	28 0	28 0 0	1 4½	11 0	19 3	27 6	154 0	154 0 0
3¼	2 2	3 9½	5 5	30 4	30 6 8	1 4¾	11 2	19 6½	27 11	156 4	156 6 8
3½	2 4	4 1	5 10	32 8	32 13 4	1 5	11 4	19 10	28 4	158 8	158 13 4
3¾	2 6	4 4½	6 3	35 0	35 0 0	1 5¼	11 6	20 1½	28 9	161 0	161 0 0
4	2 8	4 8	6 8	37 4	37 6 8	1 5½	11 8	20 5	29 2	163 4	163 6 8
4¼	2 10	4 11½	7 1	39 8	39 13 4	1 5¾	11 10	20 8½	29 7	165 8	165 13 4
4½	3 0	5 3	7 6	42 0	42 0 0	1 6	12 0	21 0	30 0	168 0	168 0 0
4¾	3 2	5 6½	7 11	44 4	44 6 8	1 6¼	12 2	21 3½	30 5	170 4	170 6 8
5	3 4	5 10	8 4	46 8	46 13 4	1 6½	12 4	21 7	30 10	172 8	172 13 4
5¼	3 6	6 1½	8 9	49 0	49 0 0	1 6¾	12 6	21 10½	31 3	175 0	175 0 0
5½	3 8	6 5	9 2	51 4	51 6 8	1 7	12 8	22 3	31 8	177 4	177 6 8
5¾	3 10	6 8½	9 7	53 8	53 13 4	1 7¼	12 10	22 5½	32 1	179 8	179 13 4
6	4 0	7 0	10 0	56 0	56 0 0	1 7½	13 0	22 9	32 6	182 0	182 0 0
6¼	4 2	7 3½	10 5	58 4	58 6 8	1 7¾	13 2	23 0½	32 11	184 4	184 6 8
6½	4 4	7 7	10 10	60 8	60 13 4	1 8	13 4	23 4	33 4	186 8	186 13 4
6¾	4 6	7 10½	11 3	63 0	63 0 0	1 8¼	13 6	23 7½	33 9	189 0	189 0 0
7	4 8	8 2	11 8	65 4	65 6 8	1 8½	13 8	23 11	34 2	191 4	191 6 8
7¼	4 10	8 5½	12 1	67 8	67 13 4	1 8¾	13 10	24 2½	34 7	193 8	193 13 4
7½	5 0	8 9	12 6	70 0	70 0 0	1 9	14 0	24 6	35 0	196 0	196 0 0
7¾	5 2	9 0½	12 11	72 4	72 6 8	1 9¼	14 2	24 9½	35 5	198 4	198 6 8
8	5 4	9 4	13 4	74 8	74 13 4	1 9½	14 4	25 1	35 10	200 8	200 13 4
8¼	5 6	9 7½	13 9	77 0	77 0 0	1 9¾	14 6	25 4½	36 3	203 0	203 0 0
8½	5 8	9 11	14 2	79 4	79 6 8	1 10	14 8	25 8	36 8	205 4	205 6 8
8¾	5 10	10 2½	14 7	81 8	81 13 4	1 10¼	14 10	25 11½	37 1	207 8	207 13 4
9	6 0	10 6	15 0	84 0	84 0 0	1 10½	15 0	26 3	37 6	210 0	210 0 0
9¼	6 2	10 9½	15 5	86 4	86 6 8	1 10¾	15 2	26 6½	37 11	212 4	212 6 8
9½	6 4	11 1	15 10	88 8	88 13 4	1 11	15 4	26 10	38 4	214 8	214 13 4
9¾	6 6	11 4½	16 3	91 0	91 0 0	1 11¼	15 6	27 1½	38 9	217 0	217 0 0
10	6 8	11 8	16 8	93 4	93 6 8	1 11½	15 8	27 5	39 2	219 4	219 6 8
10¼	6 10	11 11½	17 1	95 8	95 13 4	1 11¾	15 10	27 8½	39 7	221 8	221 13 4
10½	7 0	12 3	17 6	98 0	98 0 0	2 0	16 0	28 0	40 0	224 0	224 0 0

the two bolts which hold the ejector bar in place and remove the bar and ejectors. Remove the caps from the main shaft bearing and lift out the saw discs (or pin cylinder) entire. Unscrew the nut on the gear end of this cylinder and strip off all saw discs necessary to remove the broken ones, and after replacing them put back washer and nut, being careful to screw up the nut very tight. Not less than a 15-inch wrench should be used for this purpose. The saw discs (or pin cylinder) can then be replaced in position.

To replace the ejectors introduce each ejector separately into spaces between the saw discs, resting the small end of each ejector against the shield. There will then be presented a trough formed by the notches in the small ends of the ejectors. Into this trough lay the ejector bar, and firmly holding this latter in place rotate the whole mass of ejectors toward the operator until the bar is brought into position between its supporting lugs. Then, holding the bar with one hand, introduce first one holding screw and then the other into place and screw up tight.

The seeds are removed from the saw discs (or pin cylinder) by a scraper knife located under this cylinder. The edge of this knife should be exactly $\frac{1}{32}$ of an inch from the points of the saw discs. Nearer than this will cause the raisins to be torn; further than this will break the seeds. If this knife is removed for any purpose, care should be taken to see that it is properly adjusted before commencing work again. There are two set screws by which the knife can be properly fixed in position.

These machines are properly adjusted before leaving the manufacturer's premises.

Red or Blood Sausage.—Use the meat from the belly, chuck bones lean and fat. You may also use the heart at your option. Cut in small pieces, cook from one to three hours, according to the age of the hog, pour off the grease that rises to the top of the water. After the meat is well freed from grease, to 100 lbs. add the following:—Salt 29 ozs., marjoram $3\frac{1}{2}$ ozs., pepper $5\frac{1}{4}$ ozs., cloves 1 oz., ginger 1 oz. Have it all ground fine. Use meat and blood in proportion to make a soft mass, but before mixing the blood with the meat, all the lumps of blood should be passed through a fine sieve, to make it of the proper consistency. Then fill the mass into large casings (not too tightly), and tie the ends. Place the sausages in boiling water, stirring continually, or the blood will collect on the under side. As soon as the sausage begins to float, prick with a fork the places where the fat gathers. If care is not taken in doing this the sausage will not be good; boil them as long as the fatty substance in them escapes. Then remove and wash in cold water; they are then ready for eating either hot or cold. Sausage prepared in this way will not keep any length of time, especially in warm weather. If they are to be kept longer they must be smoked. In smoking, hang them so they do not touch each other. Some butchers smoke them as long as seven days. After removing from the smoke house they must be placed in the refrigerator.

To this class of sausage also belongs the so-called Gruetzwust, or pealed buckwheat grain sausage. It is made the same as the preceding, with the exception that, just before stuffing, you make a dough of buckwheat, using the necessary salt, and mix with the meat according as wanted, using more or less buckwheat. Commonly, two to four parts of buckwheat are used to one part of meat, and a little more spice than in the blood sausage. Cool as before. Gruetzwust cannot be smoked, but must be eaten fresh. It is fried with butter or lard, as suits the taste.

Red Pepper.—see Cayenne.

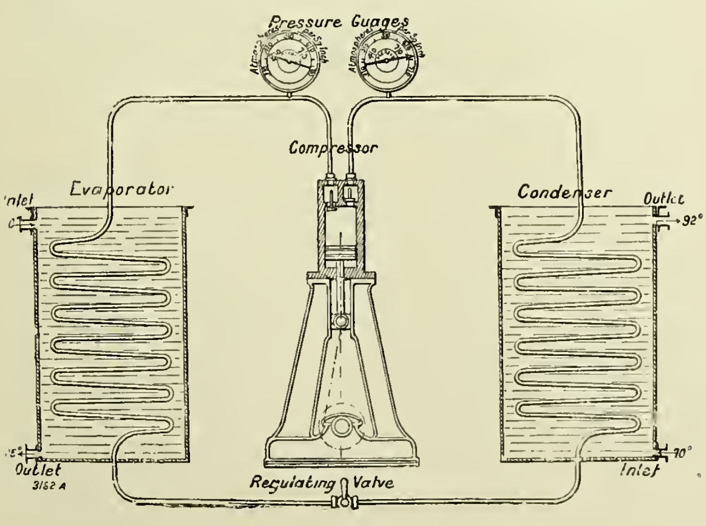
Refrigerating Chambers.—see Cold Chambers.

Refrigerating Machines.—When a volatile liquid, such as ether, is poured into the hollow of the hand it evaporates rapidly, leaving a sensation of cold. This is due to the fact that liquids, when changing into vapours, absorb and render "latent" (or insensible to the thermometer) a considerable amount of heat. When the liquid is volatile and evaporates rapidly there is a correspondingly rapid absorption of heat, which is drawn from the atmosphere or any other warm body in contact with the liquid. In the above instance the sensation of cold was caused by the ether in its evaporation drawing some of the necessary heat from the hand. If the ether is placed in a coil of pipe immersed in brine the heat necessary for evaporation is abstracted almost entirely from the brine, and if a pump is attached to the one end of the pipe so as to withdraw the ether vapour and cause a partial vacuum, the process of evaporation is hastened and the refrigerating effect is correspondingly increased. In practical working it would not pay to pump the ether vapour into the air and waste it, so we would naturally attach another coil to the exit side of the pump and compress the vapour, by which means it is made to give up the latent heat it has absorbed, and if we immerse the compression coil in cold water or run water over it the heat is absorbed by the latter and the ether vapour becomes a liquid again, which can be returned by a suitable pipe, with valve to regulate the flow, to the evaporating coil, and so the process of evaporating and condensing goes on continuously. Ether is not very much in use now as a refrigerant. It evaporates slowly, having a comparatively high boiling point, and its refrigerating effect, especially at low temperatures, is relatively small. Nearly all modern machines use liquefied carbonic anhydride, liquefied anhydrous ammonia, or liquefied sulphurous acid as the refrigerant. A few makers use methylic chloride and ethylic ether, but the first three mentioned substances are the only ones in general use. When air is compressed it gives out heat, and if cooled in the compressed state and then allowed to expand, heat is re-absorbed and refrigeration results. The cycle of changes is the same as with the volatile liquids, with the exception that no liquefaction takes place.

The Refrigerator, or compressor, is simply a kind of pump specialised in form and material to suit the purpose to which it is applied and the particular refrigerating liquid made use of. The suction end is connected to the evaporator, and by forming a partial vacuum greatly accelarates the speed of evaporation of the volatile liquid it contains, the refrigerating effect being increased in proportion. The delivery end is connected to the condenser, where the process is exactly reversed. The vapour is compressed, and the latent heat is changed to active heat, and the vapour becomes very hot. The application of cold water removes this heat, and the pressure containing the vapour reassumes the liquid form and is passed to the evaporator by a regulated passage, to be used over again.

The Evaporator is the apparatus in which the refrigerating effect is first produced by the evaporation of the volatile refrigerant. It usually consists of a coil of iron or copper piping from ½ inch to 2 inch in diameter, inside of which the refrigerant is placed. One end of this coil is connected to the suction side of the compressor, and the other to the exit end of the condenser. The evaporator may be placed in the space to be cooled, and this is called cooling by "direct expansion." Frequently, however, the evaporator is fixed in a tank of unfreezable brine, which is first cooled and then circulated by means of a pump through coils of pipes or "brine drums" in the space or material to be cooled. Another modification is the "air cooler" system, in which the air of the space to be cooled is circulated by a fan over (1) the evaporator coils or (2) over the coils of pipes containing cold brine or (3) is brought into direct contact with the cold brine. To secure equal cooling the air is withdrawn from the space to be cooled at a great many points by means of "air trunks" with openings at regular intervals, the flow being equalised by sliding regulators at each opening. These "suction air trunks" are connected to the fan, and the air is propelled over the above mentioned cooling coils, or brought in contact with the cold brine and then returned to the space to be cooled by "delivery air trunks" of similar construction to the suction trunks.

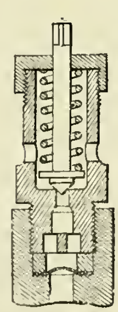
The Condenser consists of similar coils of piping to those used in the evaporator. These coils may be immersed in a tank of cold water, the water being continually changed by running in fresh cold water at the bottom of the tank, and allowing the heated water to overflow at the top. This is called the submerged condenser. Another form of condenser is that in which the coils are placed above the water tank, and the water is pumped up, and by special apparatus is made to trickle all over the condenser coils, the cooling effect being increased by the rapid evaporation of the water as it runs over the coils. As the whole of the heat abstracted by the evaporator, plus that due to the friction of the compressor, must be carried off by the condenser water, it is obvious that in the case of the larger installations the question of water supply is an important one, and it is now the common practice to use the water over and over again. In the case of the submerged condenser, the heated water is pumped up to a tank exposed to the atmosphere, and there finely divided into sprays by special nozzles.



Evaporation is thus much increased, and the water is cooled sufficiently to be used over again in the condenser. The loss of water by evaporation averages about ten per cent. In the case of the evaporative condenser, which is usually placed in the open air, the special re-cooling tank is not necessary, or rather it forms a part of the apparatus, and the cooling water is used over and over again continuously, with the necessary additions for loss by evaporation.

The Regulator is a very important piece of apparatus in the working of refrigerating machinery. It consists of a finely adjusted valve or stop cock placed on the pipe connecting the condenser and the evaporator, and its function is to regulate the flow of liquified refrigerant from the former to the latter. This must be done with the greatest nicety. If the regulator is too much closed, too little refrigerant gets into the evaporator, and difficulty in refrigeration is the result. If the regulator is open, too much excess of liquid flows to the evaporator, which may get filled up and the liquid overflow to the compressor, stopping all refrigeration, as evaporation cannot take place, and also possibly injuring the machinery, which is constructed to pump vapour and not liquid. The valve or stop cock should have some sort of scale to let the operator know how far it is open, but his chief guide to correct regulation is the readings of the gauges, placed one on the evaporator coil and the other on the condenser. These should be kept at certain figures, varying with the refrigerant used; and a glance at them will inform the experienced operator if the system is working rightly or not. The diagram on this page, issued by Messrs J. & E. Hall, Limited, of Dartford, illustrates very clearly the composition of the modern refrigerating machine, and the relation of its parts to one another.

Refrigerating machinery is now used for a variety of purposes; and it is calculated by Mr Arthur Gall that the total number of refrigerating machines in use would make 200,000,000 tons of ice a year, and the amount of coal necessary to produce this quantity would be 20,000,000 tons. Mutton and beef are imported in enormous quantities in ships fitted with refrigerating machinery, from Australia, New Zealand, the Argentine, etc., the carcases being maintained at temperatures from 16° F. to 24° F. On the shorter voyage from the United States the meat is merely chilled. Butter is brought from the Antipodes in perfect condition in the frozen state; eggs and butter are stored up in cold rooms in the summer time, when they are cheap, and delivered fresh and sweet in the winter time, when they fetch good prices. Fruit, hops, fish, game, poultry, etc., etc., can also be kept with great advantage in refrigerated rooms. Hitherto the retail butcher has relied chiefly on ice for the preservation of his meat, but now the progress of invention has placed small cheap refrigerating machines within his reach; and we reproduce on next page an illustration of the latest, which, being worked with sulphurous acid as the refrigerant, and the working pressure being low can be cheaply constructed.



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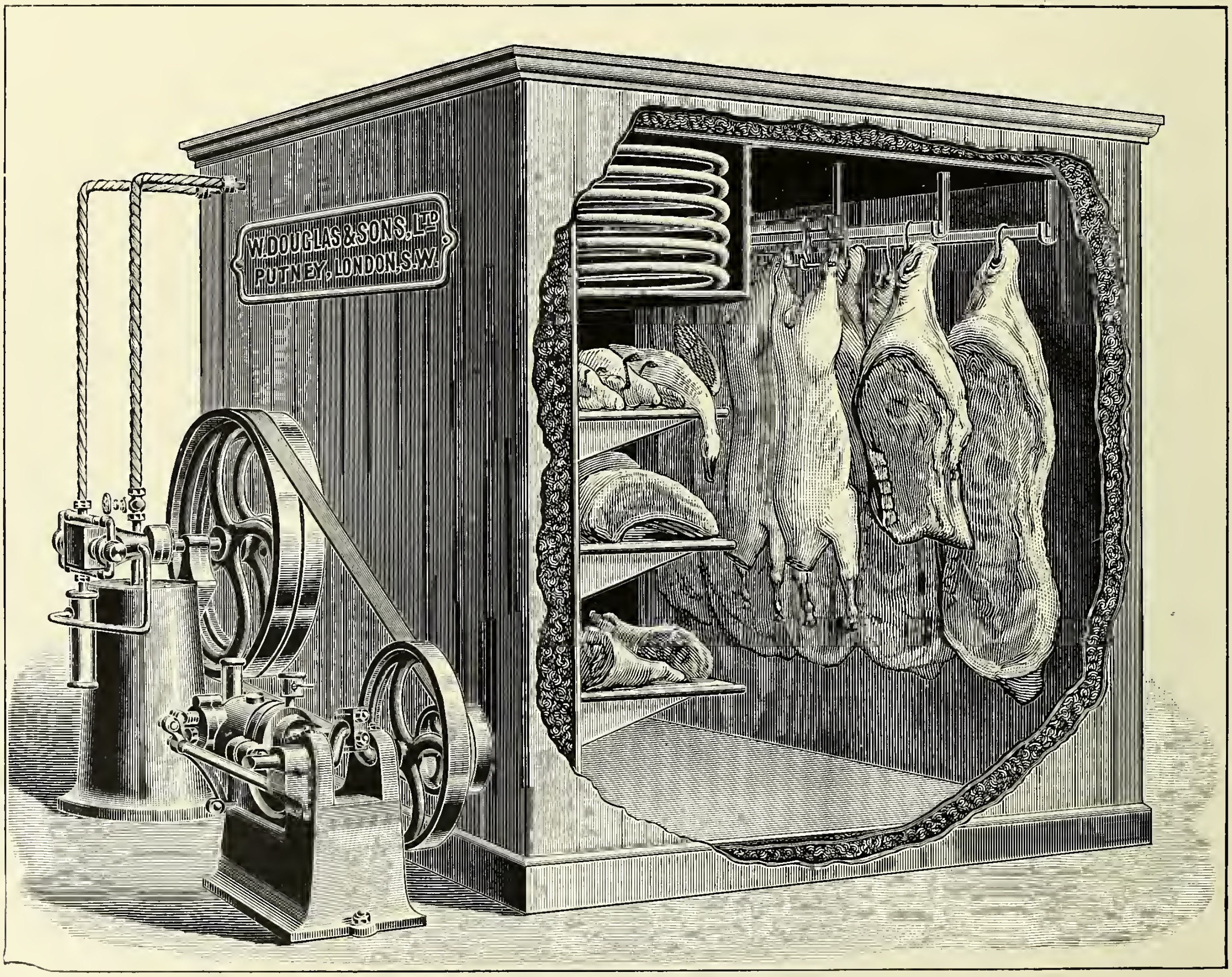
Refrigeration is also used on a large scale in bacon factories, breweries, oil-works, and a variety of other industrial processes. It is also extensively used for the artificial production of ice, which is

now manufactured in ever-increasing quantities. It is a curious reflection that it should be possible to produce ice by the consumption of coal. The difference between ice and water is due simply to the abstraction of heat, latent and active, from the latter. To do this artificially, where the general temperature is above the freezing point, requires force, and the function of the coal is simply to produce the force necessary, which, being applied through the compressor to the rapid evaporation of the volatile refrigerant, brings its temperature down to a very low point. Compensation is then obtained from



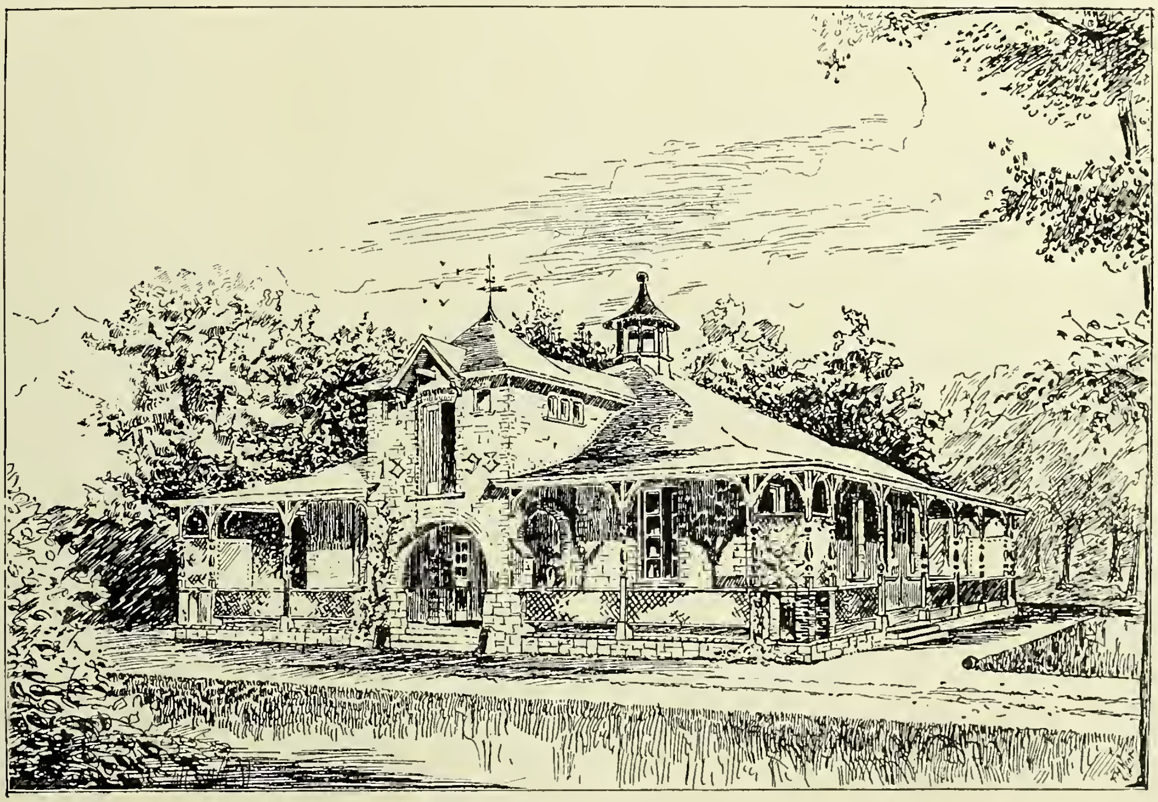
The Douglas-Conroy Patent Sulphurous Acid Refrigerating Machine.

surrounding objects relatively hotter; and if water should be the surrounding medium, it will, when a certain amount of latent and active heat has been abstracted, turn into ice. Water, however, will also in its turn readily abstract heat from surrounding bodies higher in temperature; hence, if ice is to be made, it is necessary to interpose a non-conductor or "insulation," to prevent the excess of external heat. On the practical scale, the ice-making apparatus most commonly used, consists of a tank insulated with silicate cotton, charcoal, or cow-hair, and containing an unfreezable brine. In this brine, galvanized iron cans, containing from 28 lbs. to 1 cwt. each, of water to be frozen, are sunk in the brine and arranged in rows, with proper supports and means of lifting and lowering them. The brine is cooled either in a separate evaporator tank, and circulated in the ice-making tank by a pump, or the evaporator coil is placed in the ice tank, and the cooling is done by direct expansion. If the ice cans are not too thick the freezing can be accomplished in 12 hours. The ice is removed from the cans by dipping them in warm water, when the blocks are slightly melted on the outside, and then slide readily out of the cans. All ordinary water contains a certain amount of air in solution, but when in the act of freezing it becomes incapable of holding this air in solution, and it is given off in small globules, it makes the resulting ice opaque, or what is called in trade parlance, "rotten." Ice of this sort is not a very merchantable article, and means have to be taken by the manufacturer to prevent the air being frozen into the ice. The water may be boiled or distilled, and the dissolved air is thus entirely removed; or mechanical agitating apparatus may be fitted

to the ice-freezing cans, by which the air, after separation, is caused to rise to the surface of the water, and is thus removed. Artificial ice, if proper care is taken with the water, may be perfectly pure and free from germs; whereas, natural ice is frequently very impure, and its use no doubt sometimes conduces to the dissemination of disease.

In connection with refrigeration, various means of measurement are necessary. For temperature the thermometer is used. In this country the Farenheit scale is almost universally in use, but on the Continent the Reaumer and the more scientific Centigrade scales are preferred. The measurement of heat is based on the thermal unit, which in this country is the amount of heat required to raise one pound of water one degree Fahrenheit. This is the British thermal unit, commonly contracted to "B.T.U." Its place is taken on the Continent by the "Calorie," which is the amount of heat required to raise one kilogram of water one degree Centigrade—practically four times as much as the British thermal unit. The capacity of a refrigerating machine is expressed in the number of B.T.U. it will eliminate in a certain time under specified conditions as to temperature of cooling water, etc. Different bodies are not heated to the same degree by a similar amount of heat. Thus a hundredweight of beef only requires about three-quarters of the amount of heat to raise it to a certain temperature that is needed to raise a hundredweight of water a similar number of degrees. This is called "specific heat"—in other words each substance has its own capacity for heat. This has to be allowed for in calculating the amount of work a machine will do in refrigerating meat, butter, cream, etc., etc. Other measures used are the hydrometer for testing the strength of the unfreezable brines employed, and the hygrometer for measuring the percentage of humidity in cold chambers, bacon cellars, etc.

Although the larger proportion of refrigerating machines in use are constructed on the principles described above, it is necessary to mention two other machines constructed differently. In both of these, strong solution of ammonia is made use of in place of anhydrous ammonia. In each case the liquid ammonia is distilled and separated into anhydrous ammonia and water, and the anhydrous ammonia is the real refrigerant. In the one case a compressor is made use of to assist evaporation, but the ammonia vapour is dissolved again in the water from which it was distilled, which completes the cycle. In the other machine no pump is used, but after distillation the water from which the anhydrous ammonia has been expelled is cooled and the ammonia distils back again and is re-dissolved in the water. To produce continuous refrigeration it is necessary to have the distilling apparatus and the receiver in duplicate so that they may be worked alternatively.



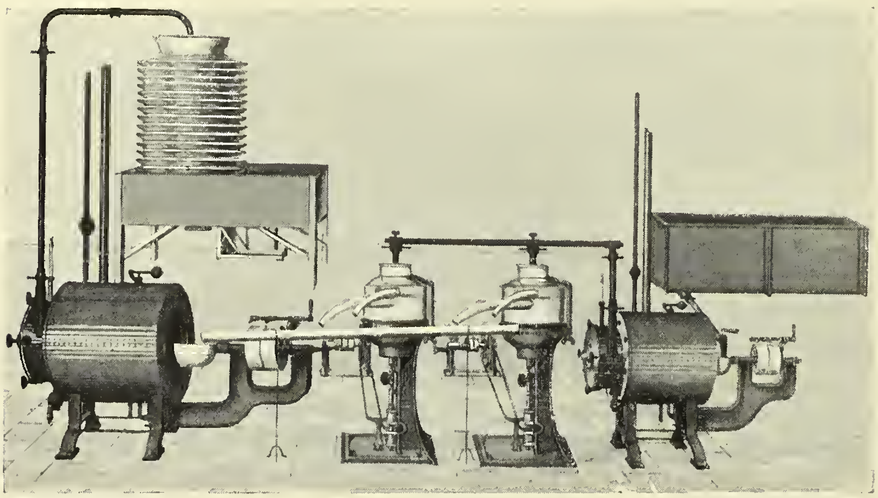
An Ideal Dairy.

Refrigerating Rooms.—see Cold Chambers.

Refrigeration in the Dairy (Written January 1900).—The great part that refrigerating and pasteurising plant plays in the work of the dairy is becoming more and more recognised every day. In Denmark, which is the leading European country for the production of butter, pasteurisers and refrigerators are universal. The pasteurising process is a very simple one, and is designed with a view to the destruction of certain germs or spores which exist in fresh

milk. The milk is received in the receiving tanks from the farmers, and, as it is taken into the dairy, samples are taken to be tested afterwards by the butyrometer, or other handy means, for butter fat. The milk is then run through the pasteuriser. This is a very simple device, consisting of a jacketed pan, inside of which there is fixed beaters or agitators, so as to quickly bring the milk in contact with the heated surface of the pan. The milk flows in by gravitation, and the centrifugal force exerted by the beaters forces its elevation high enough to enable it to flow into the separators. Here it is at once separated, and the cream is collected and cooled by means of Schwarz pans, or better, by passing over the surface of a circular or flat cooler, in which chilled water is running, or brine is being circulated.

Cream Cooler. Milk Receiving Tank.



Cream Steriliser. Separators. Milk Pasteuriser.

Milk Pasteurising and Cream Cooling Machinery.

This cooling of the cream is a very important matter, as the quicker it is cooled, to say 55° F., the sooner is the ripening begun, and the better the product.

The design of a modern dairy is altogether different from the ancient form, and is modified because of the introduction of pasteurisation and refrigeration. Not only is the fresh milk pasteurised, but the separated milk is heated to a higher temperature still after leaving the separator, as for feeding purposes it has been proved to be less dangerous to calves and pigs when so treated. The butter, when produced, is stiffened in the chill rooms before being sent out, generally at a temperature of 35° F.

It is obvious, therefore, that to efficiently conduct the dairy business requires considerable capital. That the investment of money in the industry pays, cannot be doubted—more especially in England, where there is a market for an unlimited supply of first quality of dairy produce. We give a few illustrations of an ideal dairy.

The factory has the following compartments:—Receiving, pasteurising, separating and cooling room, cream ripening room, butter making room, chill room, freezing room, engine and steam producing room, can washing room, refrigerating machine and ice-making room. These departments are very complete, and each is fitted with its full complement of appliances, as will be gathered from the plan.

The refrigerating machine shown is a patent CO_2 machine of the vertical type, and is utilised for ice-making, chilling water for use in the dairy, and cooling the chilling and freezing rooms.

The freezing room is fitted with a large cooling surface in the shape of shallow and deep brine walls without diaphragms. These shallow brine walls are spaced equally across the roof so as to distribute their influence. The chill room is fitted with deep brine walls only, with diaphragms in front, the temperature being higher than in the freezing room.

One notable feature of the chill room is the provision of milk cooling coils. These are simply tinned copper coils, which can be connected at will to the brine circulation. The coils are dropped bodily into milk cans, and the temperature so lowered at once. It is obvious that for the transport of fresh milk this process will be of great value.

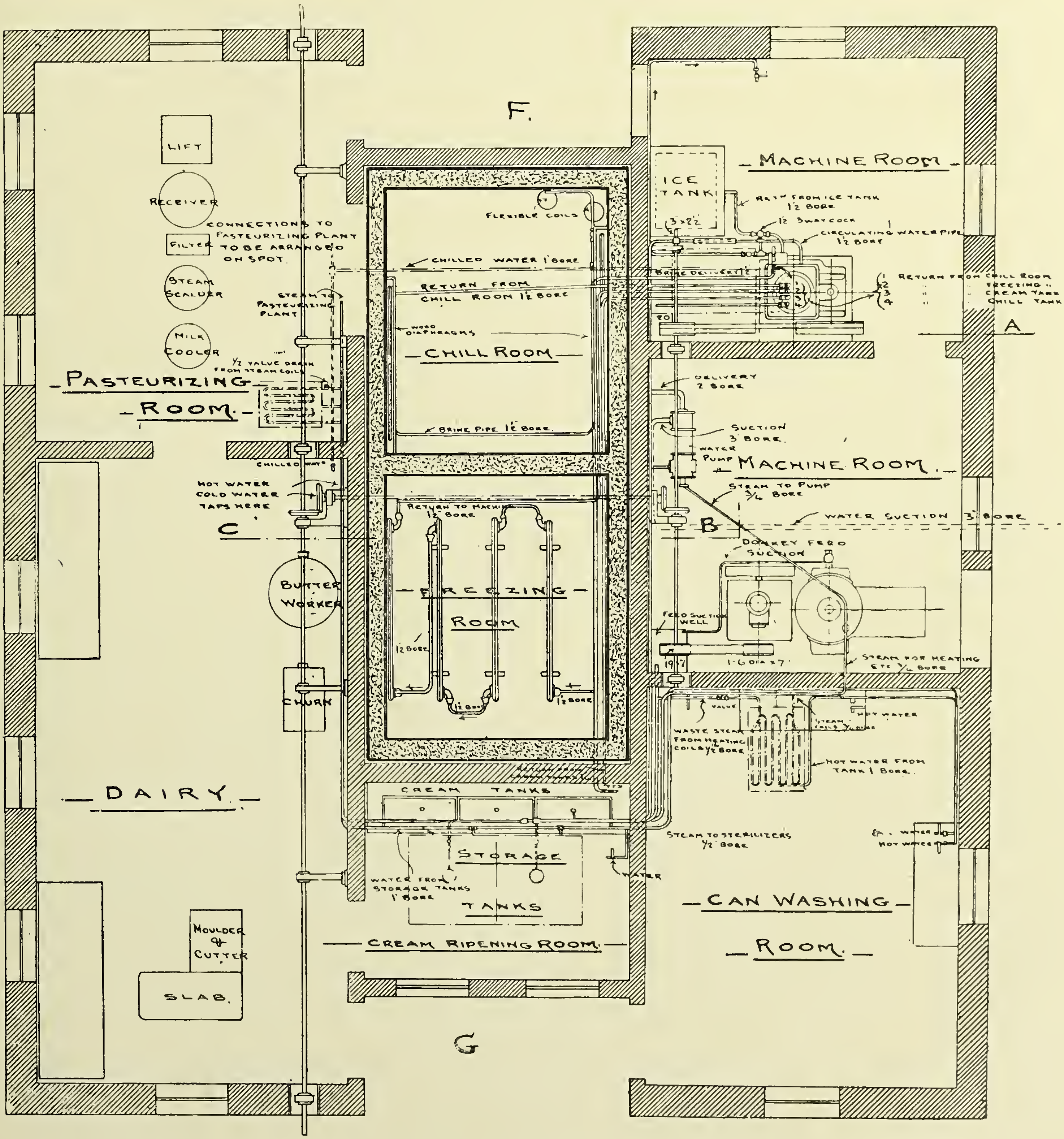
The building is most picturesque, it is of the châlet type, and has a verandah all round. The material used is slate faced with brick, and the roof is tiled.

Refrigeration in the Creamery.—Nothing has attracted greater attention in modern times in connection with creamery work than the recent introduction of refrigerating machinery sufficiently small and inexpensive as to be within the reach of the great majority of the creameries. The price of refrigerating machines has been so high that creameries have had perforce to resort to ice, either for cooling water, or cream, and all who are associated with cream production know very well what a great tax that involves on the production of butter.

It was not unusual for the creamery manager to find that when his cream temperature at ripening was up to, say, 65° F., he could not get cooling water to reduce it to 52° F. — the churning temperature. The result was — bad butter. Not having a refrigerating machine, he at once looked around for a supply of ice, which he found only obtainable from a factory a long way from his creamery. Having arranged for a supply, he had to wait patiently for it to come, with the knowledge that delivery was dependent upon the general demand. When the ice did arrive he found that it had shrunk quite one-third in weight since it left the ice factory or depôt, but, with hot weather and the demand for ice great, he had to make the best of it. It is satisfactory to be able to state that these conditions can now be easily changed by the introduction of a refrigerating machine into the creamery. These small refrigerating machines which have been recently introduced are likely to work that revolution in the creamery which everyone will acknowledge is necessary.

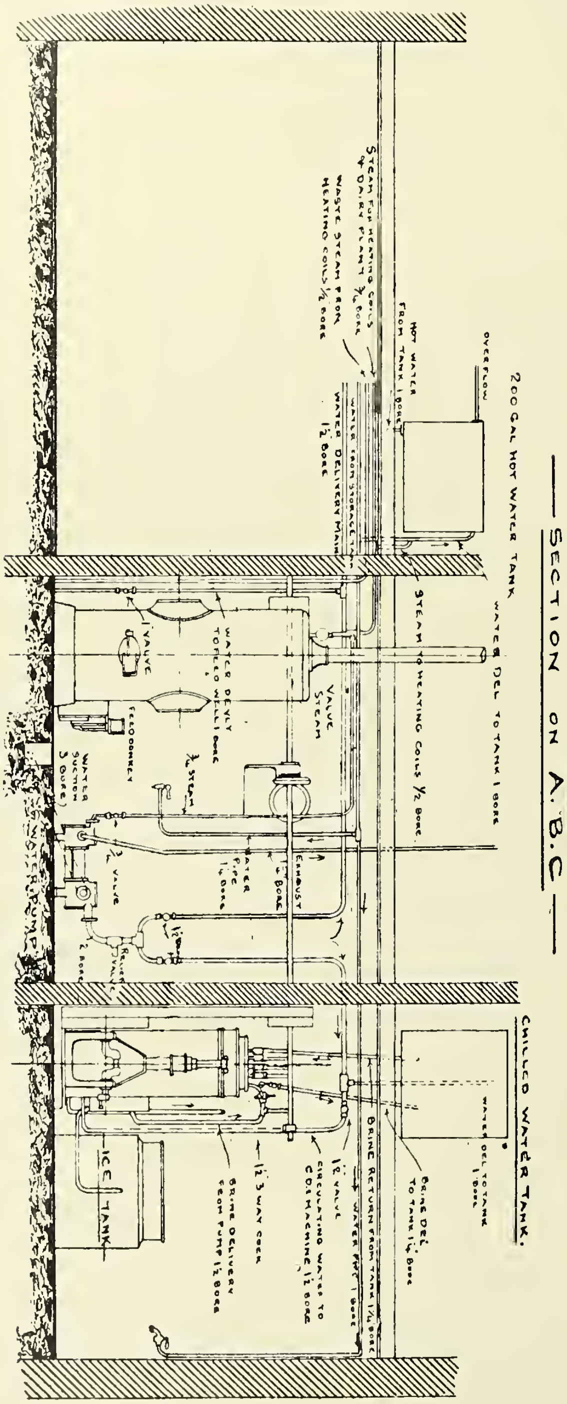
Let us glance briefly at the operations carried out in a modern creamery in summer.

The milk is brought by the farmer to the creamery in churns of, say, twenty gallons each, and delivered at a temperature of about 70° Fahr. (In winter it is about 42° F. generally). After being measured or weighed it is placed in the milk receiving tank, from whence it runs by gravitation to the "pasteuriser," where it is heated to from

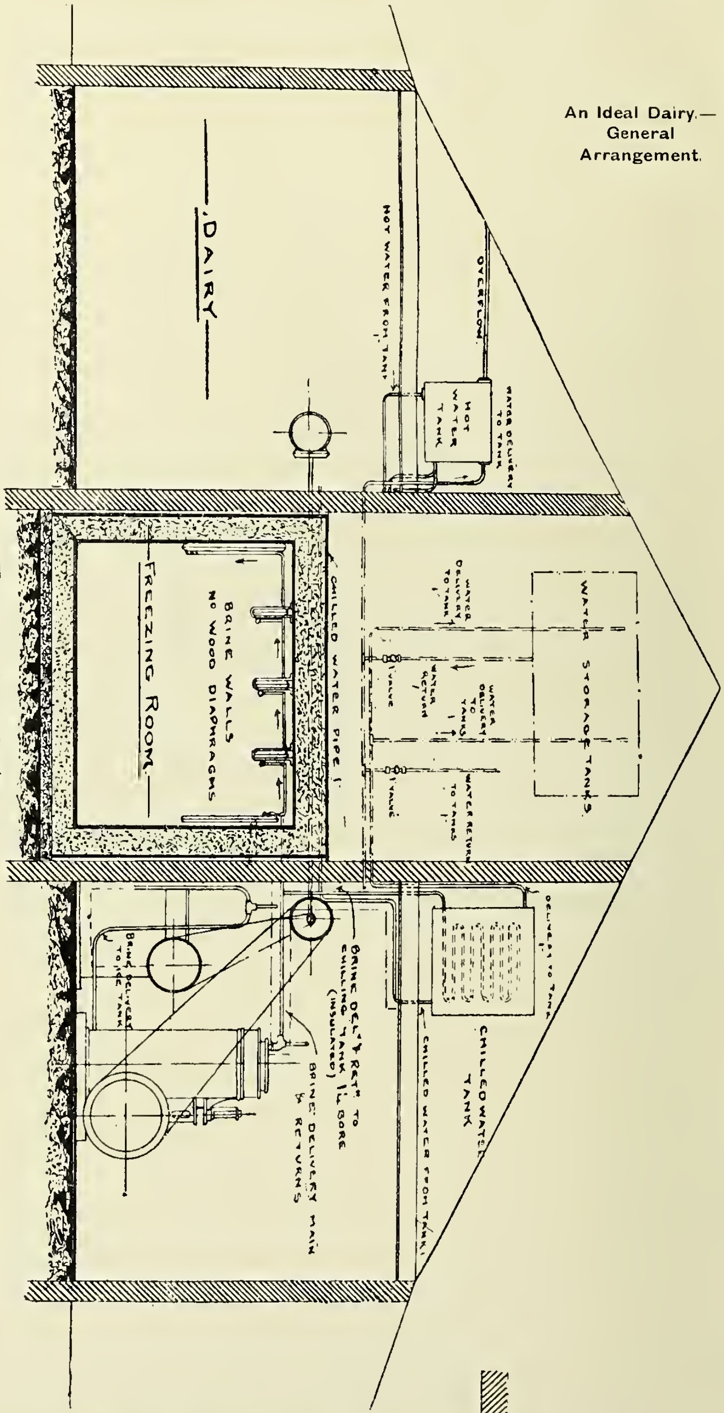


Plan

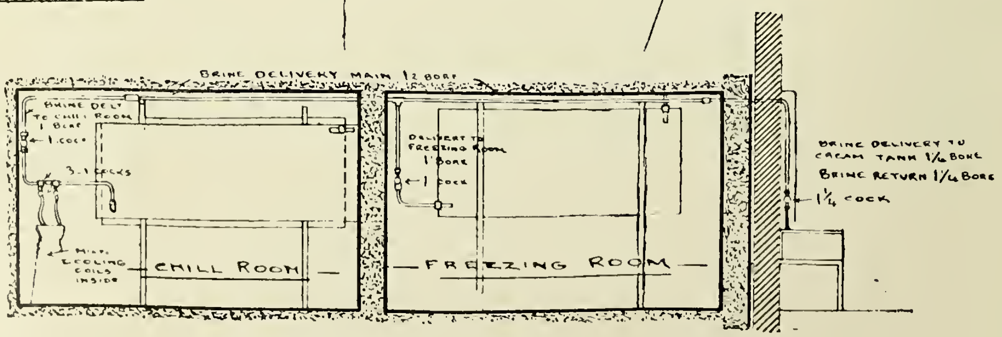
An Ideal Dairy.—General Arrangement



Longitudinal Elevation.—Section through Machine Rooms, D.E.

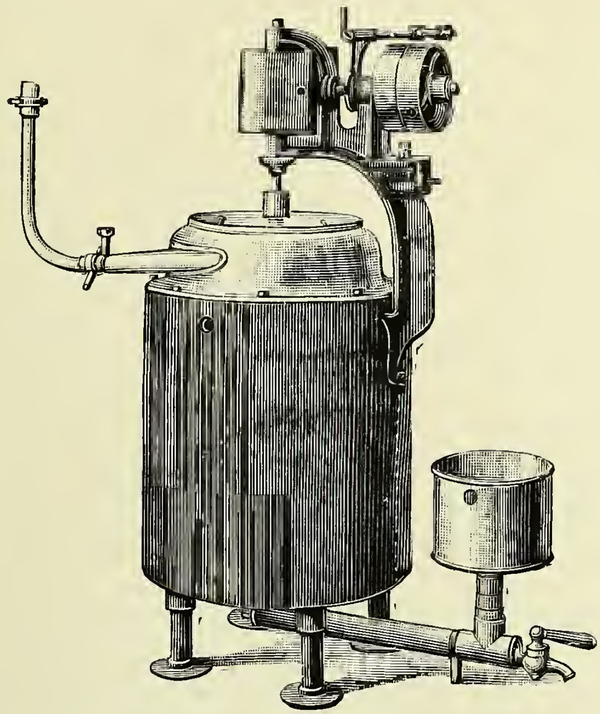


An Ideal Dairy.—General Arrangement.



Section through Cold Chambers, F.G.

160° or 170° Fahr., this being recognised as about the best temperature for separating. At the same time, this temperature is fatal to many germs which readily find a congenial home in fresh milk.

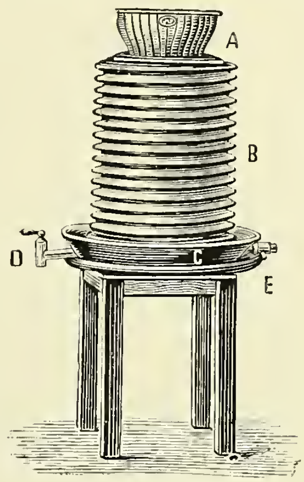


Vertical Pasteuriser for Pasteurising Fresh Milk.

The difference between pasteurisation and sterilisation is worthy of note. "Pasteurisation" (says Mr A. Poole-Wilson) means the heating up of the milk to a sufficiently high temperature for a sufficient length of time in order to kill the full-grown bacteria, and then cooling down to such a low temperature that any spores or seeds left cannot develop. The cooling is quite as essential as the heating. "Sterilisation" means "rendering the milk absolutely free from bacteria or their spores," so that the milk, if protected from outside contamination, by means of a closed bottle for example, will keep sweet for any length of time. To sterilise, the milk must first be heated up to a high temperature in order to kill the full-grown bacteria, and then cooled down to such a temperature that any spores left will develop; the temperature is again raised to kill the bacteria developed from the spores; again cooled to a temperature suitable for the development of any spores left; heated again, and then cooled down to a low temperature, the whole of the operations being carried on in special apparatus, and so that there is no chance of outside contamination. This latter point is generally managed by having the milk in bottles, which are closed while in the sterilised atmosphere of the "steriliser." This explanation is necessary owing to the constant misuse of the two words. "Sterilisation" is not needed in butter making.

"Pasteurisation" is advisable because—"(1) By killing all the bacteria in the milk or cream, good, bad, or indifferent, and then introducing those that are known to be good, we are enabled to produce a uniform butter as regards flavour and keeping qualities, all the year round. (2) If marketing new milk, cream, or separated milk, we increase their keeping qualities, and are thus enabled to put them on more distant and better markets than we may have at hand, and in a better condition as a food than was formerly the case. (3) Prevention of the spread of disease by means of milk amongst men and animals."

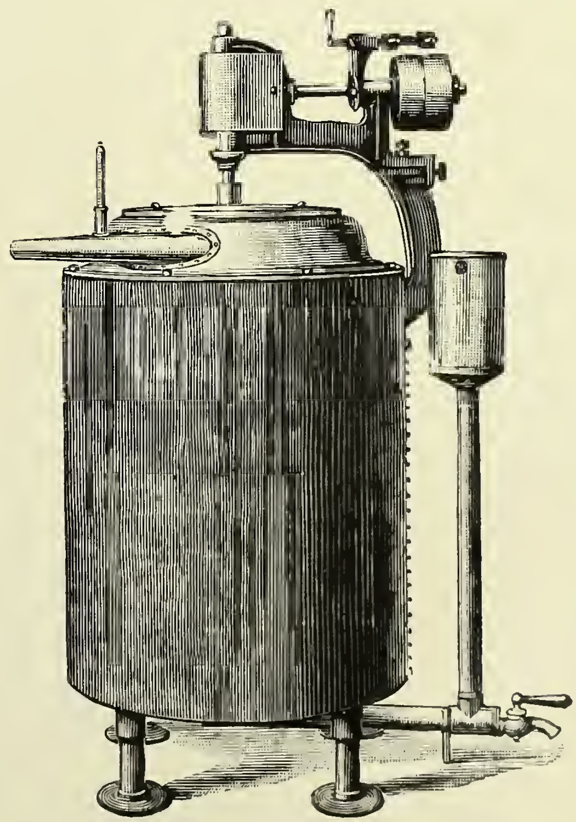
Complete pasteurisation does not take place at 170°, as the tubercle bacillus exists even at a higher temperature. For ordinary purposes, however, this temperature is sufficient.



Circular Cooler.

From the pasteuriser the milk flows to the separator, and is there separated, the cream flowing out in one direction (from the top), and the separated milk in another. Immediately the cream is separated, it should be cooled down by passing it over a circular cooler. In this cooler water is allowed to flow freely. When the cream has been passed over the cooler it should then be placed in ripening vats to ripen. As the ordinary and natural ferments have been destroyed by the pasteurisation, a "starter" must be used, and this will enable the cream to be "ripened" in from eighteen to twenty hours.

In the meantime, the separated milk is still further heated in another pasteuriser to 195°. It is then cooled, first by ordinary water in a large cooler, to within two or



Vertical Pasteuriser, for pasteurising separated milk.

three degrees of the temperature of the water supply, and subsequently may be passed over a smaller cooler in which brine from a refrigerating machine is circulated, and be cooled down to 48° Fahr., at which temperature it is returned to the farmer for feeding purposes.

The cream in the process of "ripening" attains a temperature of 65° Fahr., but at this temperature it must not be churned. The desired churning temperature is 52° Fahr., and this is only attainable in summer by the free through the cooler by means of a pump fixed on to the machine, returning again into the evaporator after having absorbed a certain amount of heat, and so having reduced the temperature of the cream passing over outside. The process is a very simple one, and requires very little explanation. The machines are made to cool from seventy to two hundred gallons per hour from 65° to 52° Fahr. The numbers of the machines are No. IA., I., II., IIA., III., IIIA., and III. Duplex.

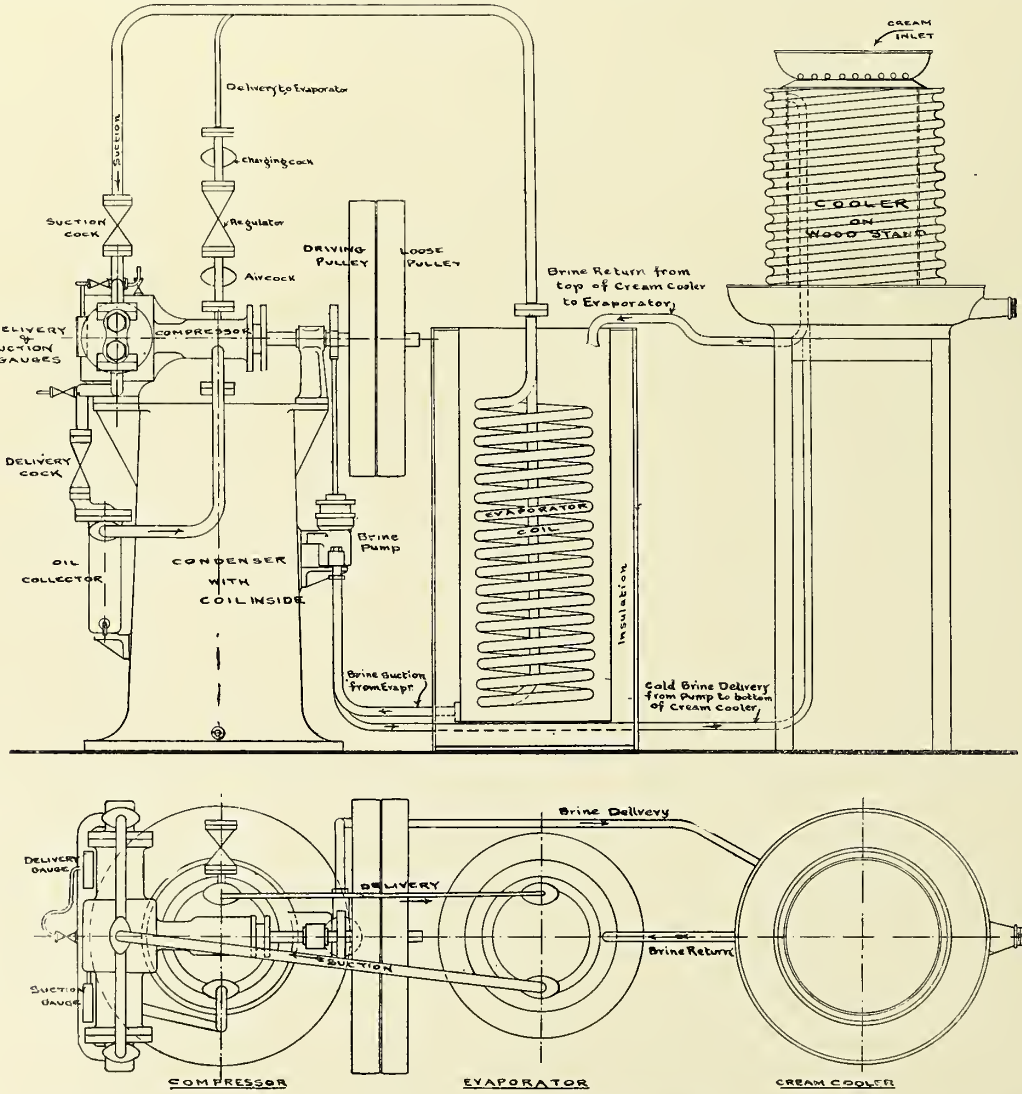


Fig. I. Sectional Diagrams showing the application of a Douglas-Conroy Refrigerating Machine to Cream Cooling by means of a Circular Cooler.

use of ice or a refrigerating machine. The use of the refrigerator in all these processes is very obvious. Perhaps it can be dispensed with for the separated milk, but not for cooling down the ripened cream.

There are several ways of applying the refrigerator to cooling, and two of these we illustrate. The first shown (Fig. I.) is by means of a circular cooler.

As will be seen, the machine is connected up first to an independent evaporator, in which is ordinary calcium chloride, or common salt brine, and this brine is pumped

Another application of this refrigerator is to Sandbach's patent cream cooler, and this is shown connected up in Fig. II.

The pump on the refrigerating machine circulates the brine through the cooler and back to the evaporator. The quantity cooled per hour depends, of course, upon the machine and its capacity for eliminating the thermal units.

The Sandbach combined cooler and heater is claimed by the patentee to be a thoroughly reliable and economical

system for the rapid refrigeration of cream. The apparatus comprises a ripening vat and combined cooler and heater, having a large amount of cooling or heating surface in a small space. It is adaptable to any class of refrigerating machine where rapid refrigeration is required, either for cream or production of ice water.

It possesses great facilities for regulating the temperature at which the cream is to be churned, for either summer or winter work. The agitation of the cream during its cooling process is arranged for by means of a mechanical agitator driven from the main shafting.

The cleansing or washing of the cooler and vat has been arranged for, the cooler being constructed in two sections, both of which can be lifted out; an ordinary union connection being all that is necessary to disconnect. Any quantity of cream may be churned at any desired temperature, and at any desired hour, while its density is no obstacle. Iced water can be produced in the apparatus during the churning operations, which can be used for washing the butter and so giving a winter-like firmness to it during the height of summer. Thorough extraction of the buttermilk is possible, and thus it has better keeping qualities. The entire plant

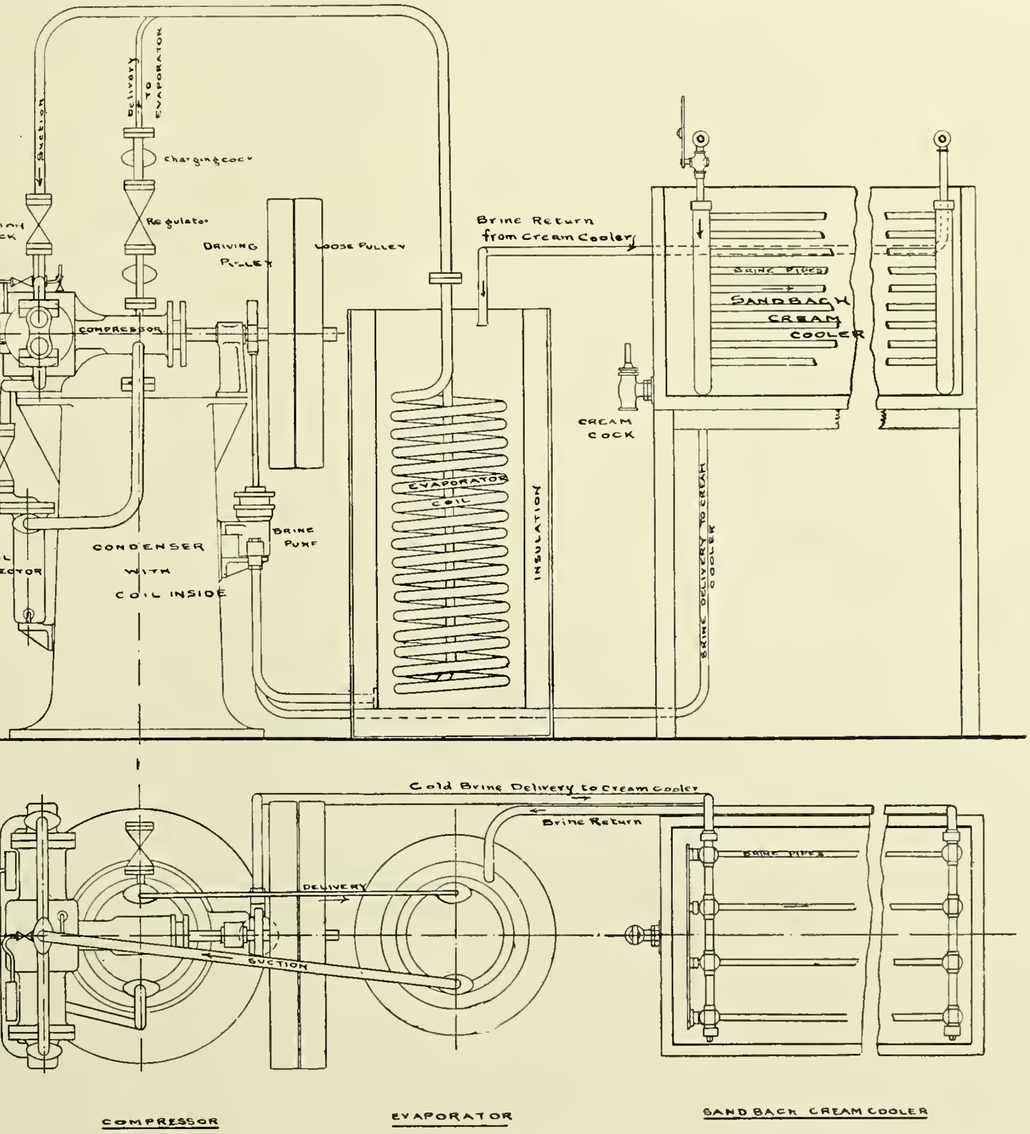


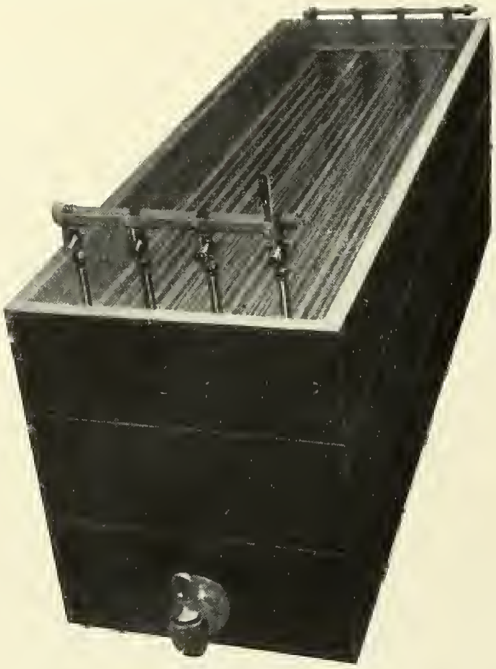
Fig. II. Sectional Diagrams showing the application of a Douglas-Conroy Refrigerating Machine to Cream Cooling by means of the Sandbach Cooler.

The apparatus is so placed in the dairy as to command the churns, the cream being first elevated by a cream pump into the vat, and allowed to remain therein for the ripening process, to be followed up by the cooling, whence it is conducted to the churns by the aid of an ordinary open tin shute. Iced water during the churning operations is quickly produced in the same vat for butter washing purposes.

will usually be paid for in three seasons by saving in the cost of ice.

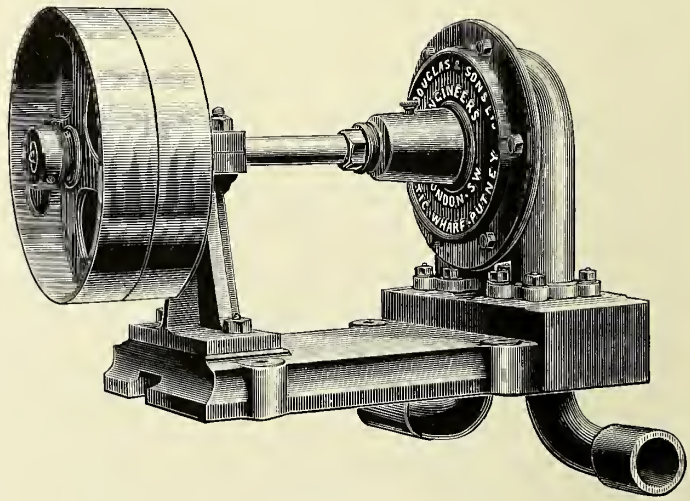
Either of these processes for cream cooling is effective and attainable at a very low price, and that is the main consideration with the majority of creameries nowadays. It must not be supposed, however, that the use of the refrigerating machine in the creamery ceases with the

cooling of the ripened cream. Water also may be cooled and used for washing the butter, so producing a hardness which is, unfortunately, often absent in summer. Furthermore, if it is so desired, the machine can be connected up to a small cold room, where the produce of a creamery or dairy may be stored.



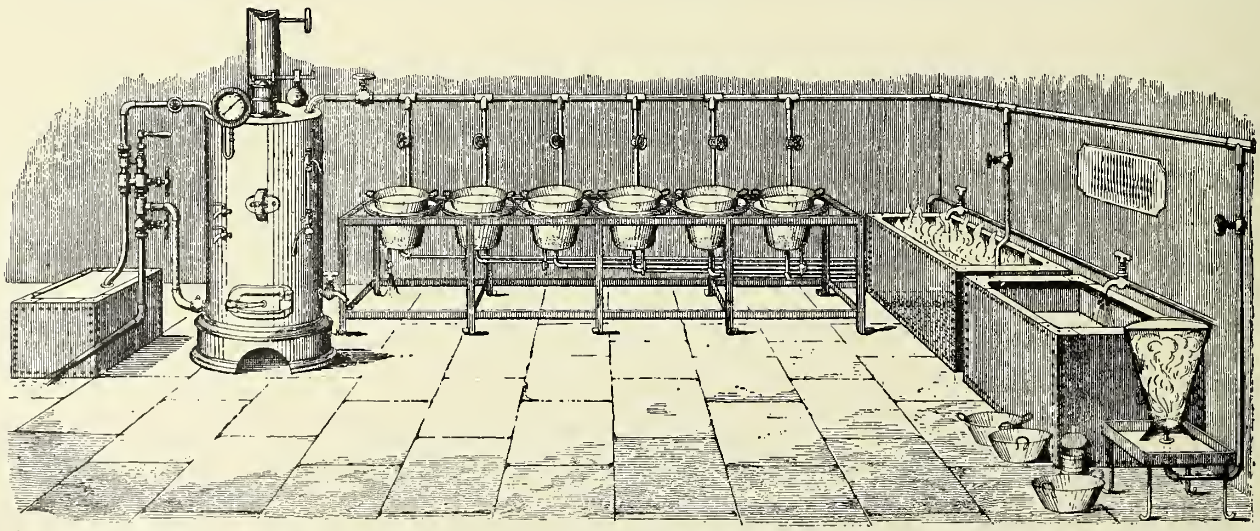
Sandbach Patent Cream Cooler.

them without being covered. When the cream registers 38° to 40° F., cork the jars firmly; then cover them with greaseproof paper which has been soaked. Tie this on tightly, and the cream will carry in a sweet state for a very long period.



Cream Pump.

The peculiar method of making cream in Devon and Cornwall is of interest to the refrigerator maker. "Clotted cream" is made by the simple process of heating milk gently until all the fat globules ascend to the surface. The milk is allowed to stand in shallow vessels for twenty-four hours, after which it is gradually heated for about an hour until all the fat has reached the surface. The heat is then turned off, and the vessels with the cream allowed to stand for another twenty-four hours, after which the cream is skimmed off.



Feed Water to Boiler. Steam Boiler. Clotted Cream Pans. Washing and Scalding Tanks for Pans

A Complete Manufacturing Plant for Clotted Cream.

The cooling of cream, water, and a cold room will not be performed simultaneously by the refrigerating machine unless made of large dimensions, but the usual small machines, if used with intelligence and so that the operations follow one another, can effectively deal with all three.

Cream which is packed in jars is also cooled before being sent out. It is always advisable to fill the jars and cool

Clotted cream is very liable to go bad under the influence of close or warm weather, and the more modern factories use a small room cooled to 40° Fahr., for the purpose of keeping the cream in an inactive or neutral state.

Renderers' Tools.—see Lard Renderers' Tools.

Rendering Pans.—see Lard Rendering Pans.

Ribs of Pork to Salt.—see Pork Ribs to Salt.

Rice.—Rice is one of the most useful and largely cultivated of all cereals, being the principal food of a considerable portion of the population of the Eastern world. It is cultivated in nearly all quarters of the globe, but principally in India, Java, Japan, and China.

The seed or grain of rice grows on little separate stalks, springing from the main stalks, and has something of the appearance, when ripe, of growing oats. Rice can only be grown in a moist soil and a warm atmosphere, and, as artificial irrigation is largely resorted to, the places it is grown in are generally very unhealthy, more especially for Europeans.

Like all cereals, there are a great number of varieties—at least 100—but the best is considered to be that grown in Java and Japan, which commands a fancy price in the European markets. In many parts of India, and some other countries, two harvests are secured each year.

The settling of Burmah was the means of opening up an immense trade in this article, and large mills are running, with modern machinery, cleaning rice for every part of India, China, Eastern, and different European ports.

The rice, when first harvested, is called "Paddy," and, before it is shipped to the Western markets, the husk (or outside skin) is roughly removed, and as soon as it arrives at its destination, it is put through machinery which removes first the remainder of the husk, then the inner skin, which is called meal, and is largely used for cattle food. The rice is then passed through polishing machines, and cleaned up to the requirements of the trade. The grain, being very brittle, breaks largely in this process; and the broken grains from the hard rice from Calcutta, Java, and Japan, are then manufactured into ground and granulated rice, which is used in nearly every household in England. The broken from the softer grain rices from Rangoon, Saigon, Moulineiu, goes largely for making into starch, containing, as it does, nearly 80 per cent. of pure starch. There is also a large business done with America in granulated rice for brewing purposes.

Rice, being hard, is considered very dangerous in the process of cleaning by the Insurance Companies, and, next to the manufacture of explosives, is rated highest.

The Japanese make a very useful paper of rice, and a kind of beer called Saki.

For poultry of all kinds, rice is considered very good, and a large quantity of partly-cleaned rice is consumed in this way.

In hot climates it is considered almost a cure for dysentry and other bowel complaints.

Rind Roll.—Take from a young pig a rather large piece of rind from which the fat has been removed. Make a paste of half veal and half pork, and season with salt, pepper, nutmeg, cloves, and some finely grated lemon rind. Work together with water, and spread two inches deep on the rind next to the fat side. Roll up lengthwise, then roll in a cloth. Tie at both ends and also round the middle. Boil from an hour to an hour and a half, and when it comes out of the pot press under a heavy weight. After twenty-four hours remove the cloth and lay in a dish.

Roast Pork, with Stuffing.—Young and well fed pork is necessary for this dish. Take a leg of pork—cut off foot, carefully take out all bones "excepting hock bone," and well stuff the cavity, from whence bones have been extracted, with very finely chopped sage and onion, pepper and salt, rub the rind well with a bit of back fat, roast before a fire or in an oven, and when half done, score the rind with a good sharp knife.

Rope Pulleys.—see Hoists.

Rose Extract.—Is dry antiseptic coloured with a harmless scarlet colour during the process of manufacture. Being soluble, this colour communicates a faint red shade to the goods with which it is mixed.

Rosemary.—see Culinary Herbs.

Rose Pink Colour.—A colour used to impart a uniform flesh tint to sausages sent out in the uncooked state. The best way to use it, is to make the quantity required for each days chopping into a paste the night before with warm water, thoroughly stirring same; this prevents specks and apparent discolourations appearing below the skin of the sausage, arising from small grains of the colour which have taken some time to dissolve. Rose pink colour should be used at the rate of 1 oz. to 10 lbs. meat or sausage material. This colour is also prepared in a liquid form known as rose pink solution.

Rose Pink Solution.—A solution made from rose pink colour and strained from all sediment or insoluble residue. It is a very handy form in which to use the colour, and it is much easier to regulate the proper quantity. One and a-half ounce of the solution is sufficient for 20 lbs. meat, and may be added to the chopping by mixing it with the water which is used with the sausage meal.

Rost Sausage.—Take 60 lbs. of lean raw meat from the cutlets and fore-quarters of the hog, 25 lbs. of veal cut from the leg, 15 lbs. of fat pork; chop very fine and add 30 oz. salt, 9 oz. ground pepper, $1\frac{1}{2}$ quarts fresh water; mix thoroughly and stuff in narrow hog or sheep casings, twist into double link sausages, each holding from 6 to 7 ounces.

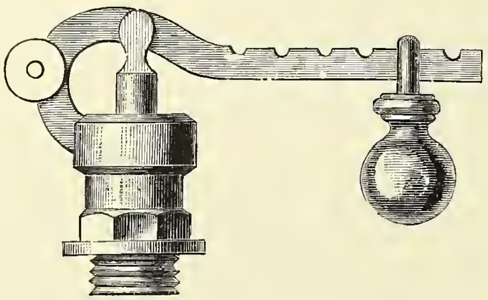
These sausages are more thoroughly smoked in the lowest part of the smoke house; but cannot be kept any length of time as they become hard and dry in the course of a week. In preparing them for the table, boil in water from 3 to 4 minutes.

Rotary Pumps.—see Pumps.

Runners.—These are the small intestines of an ox, and should be 1 in. to $1\frac{1}{2}$ in. in diameter and of a fair colour. They are used mostly for Bologna Sausage, and generally average about 20 lbs. meat to 1 lb. skin.

Safety Valve.—An apparatus affixed to a steam boiler or cooker, so arranged that it allows the steam to blow off at a certain pressure—thus preventing an explosion or other damage to the boiler. The principle on which the apparatus works is as follows:—a valve rests in a seat bored true to receive it; a lever is hinged across the valve and weighted at a given point, which represents the pressure per square

inch on the shell of the boiler—beyond which it is considered unsafe to work it. When the steam assumes this pressure the valve is lifted from its seat and presses up the lever and allows the steam to blow off, thus relieving the pressure on the boiler or cooker.



Safety Valve.

In steamships it is usual to have two safety valves, one of which can be adjusted by the engineer; while the other, known as the "Government Valve," is in a case, the key of which is kept by the captain, thus preventing overloading or tampering with the safety valve with the consequent risk of explosion. With land boilers it is usual only to have one safety valve.

Sage.—see Culinary Herbs.

Salami.—Use 50 lbs. of beef free from fibre, 25 lbs. of lean pork, 25 lbs. of fat pork; chop very fine and add 18½ oz. salt, 4½ oz. ground white pepper, 1½ oz. saltpetre, with 8 glasses of Rhine wine, in which previously has been soaked about 1 lb. of garlic; in place of Rhine wine, rum may be used. Stuff in calves' bladders. Let them hang in the open air for 2 or 3 weeks, then smoke 12 days.

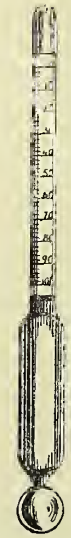
Salami de Verona.—

18 lbs. cleaned beef.
18 ,, lean pork.
14 ,, back fat.
2 ,, salt.
1 oz. powdered saltpetre.
3 ,, white pepper.
3 ,, pure cane sugar.
1 gill old French Cognac.

First mince the meat, then chop the fat in amongst it the size of beech-nuts, then mix in the spices, and chop until the fat is the size of peas. Wipe the knife often while mincing. Three sticks of garlic finely grated, may be added. Use skins for holding this, and bind with pretty thick string all the way over. For the rest, prepare like Cervelat sausage, but do not smoke, only let the salami hang for four to five weeks to dry.

Salicylic Acid.—A powerful antiseptic powder made from the oil of wintergreen and the oil of sweet birch, and also largely manufactured artificially from carbolic acid, to which antiseptic it is closely allied. It was at one time very largely used for preserving different kinds of foods, wines, jams, etc., but owing to its irritant effects the use of it in this way is now discouraged.

Salinometer.—A glass apparatus, somewhat resembling a thermometer, for determining the density of brines or pickles. There is a scale, varying from 0 to 100 on the stem, and the lower bulb is loaded with either shot or mercury. The centre and larger bulb is simply an air-vessel for keeping the salinometer afloat. The instrument takes the place, and has superseded the old-fashioned and inaccurate method of determining the density of brine or pickle by floating a pig's foot or a potato on it—a system manifestly open to great inaccuracy.



Salinometer.

Sal Prunella.—see Saltpetre.

Salt.—Chloride of calcuim, usually designated "common salt" to distinguish it from the great list of other salts, is equally soluble in both hot and cold water. The origin, nature, composition, and mode of production are usually not much thought of, but, all the same, it takes a high place in the civilisation of man. Civilised man has been defined as a cooking animal, although this carries a reproach as well as a compliment, as cooking usually destroys something like seventy per cent. of the natural salts in meat. These must, therefore, be re-instated in some form or other, and this is usually done by adding mineral salt. It is to the use of salt in dietetics and cooking that man must attribute many of the comforts of his civilised condition.

Besides the large use to which salt is put in preparing food, it also bulks largely in many other articles. Civilised man desires to be clothed, salt is used in preparing the materials from which his shirts and shoes are made. He desires to be clean, salt enters into the composition of his soap. He desires to have light, and obtains gas by the aid of salt. He desires to have the products of the innumerable industries which grow out of civilisation, and by which civilisation grows, and in nearly all of them, salt, or the alkalies made from salt, are used.

Rock salt is found to a greater or lesser degree in most countries, and a common method of procuring salt is to evaporate it from sea water. The formation of salt rock beds seems to be caused by the long-continued evaporation of inland lakes without outlets—such as the present-day lakes known as the Dead Sea and the Great Salt Lake of Utah. These lakes are fed by streams, which dissolve salt out of the soil and the mineral strata over which they flow, and deposit the same at the bottom of the lake. The Cheshire and other English deposits have evidently been formed in this way in the dim and distant ages, and the thickness of the deposits vary from 50 to 150 feet. From the Cheshire mines alone something like two to two and a quarter millions tons of salt are taken per annum; the common method of extraction being to let water into the mines, then pump out the brine formed, and evaporate same in crystallising vats. At Cardona, in Spain, some hills rising to a height of from 400 to 500 feet are entirely composed of salt; while the famous city of the salt mines in Galicia has everything required by a modern city, such as tramways, lighting, water system, etc., underground, and boasts a population of over 1000. A peculiar fact about this underground town is that the average longevity exceeds that of the surface population. In some of the mines of Galicia, salt has been mined to a depth of 12,000 feet.

Salt enters largely into the preservation of meat and general provisions, and recipés giving the quantities which ought to be used will be found in such articles as Bacon Curing, Preserving Beef, Pickle Pork, etc. It is also largely used in the dairy for butter salting, etc. In short, its uses are manifold, for as rare old Ben Jonson wrote :—

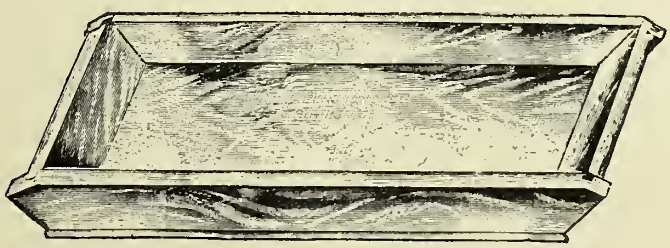
> "Take a pinch of salt,
> There's nothing like it for good health."

The different kinds of salt in common use are known by various names, such as common salt, butter salt, fishery salt, handed squares, factory-filled, sifted, and treble-refined. These names represent kinds of salts, and there are subdivisions of these kinds, bearing different names, descriptive of grain and quality. The handed square is an oblong block of salt prepared by drawing the salt out of the evaporating pans and putting it into tubs perforated with holes, from which the surplus moisture drains, and the blocks are then taken out of the tubs and wheeled into a hot-house to be baked hard or stoved. The finest and purest salt, such as is generally used at the table, is made from blocks of salt, which are taken from the hot-house to a mill, and sifted into a fine powder by machinery for the purpose.

Salting Pork (American style).—Cover the bottom of the barrel with one inch of salt; pack down one layer of pork and cover with one inch of salt. Continue this until the barrel is nearly full, or all the pork packed, then cover with a strong brine. The meat should be packed as tight as possible, the rind side down or next to the barrel, and always covered with brine. Weight the meat down if necessary. If scum arises, pour off the brine. Scald it, add more salt, and pour it back over the meat, examining beforehand if any soft rind is in the barrel. Old brine can be boiled down, and if well skimmed can be used again.

Salting Pork Ribs.—see Pork Ribs.

Salt Meat Trays.—Trays made of wood for handling salt or pickled meat. It will readily be understood that, owing to the presence of so much salt, any corrosive material in the trays would be unsuitable; the presence of the moisture from the pickle also causes the wood to swell, and thus makes tight joints.



Salt Meat Tray.

These trays are made in different sizes; but those usually found as stock sizes are 30 in. × 18 in., 32 in. × 19 in., 33 in. × 21 in. Of course any size can be made to order, as it is ordinary carpenter's work.

Saltpetre (Potassium Nitrate, KNO_3), also called Nitre.—A white crystalline salt, and usually crystallises in striated six-sided rhombic prisms. It is easily soluble in water, the solution having a cool saline taste. The specific gravity is 1·925 to 1·975. It melts at a temperature of 560° F., and ignites at red heat.

Saltpetre is mentioned as far back as the eighth century, and called sal-petræ, from the fact of the crystals being found on walls. Amongst the ancients Egypt was famous for nitre, and there was a manufactory there. At the present time it is found principally in East India, where the district of Tirhût, in Bengal, is the most important one in this repect, and whence nearly all the natural saltpetre still manufactured is derived. Small deposits have been found in Persia, Hungary, Kentucky, and other places; but such finds have not been of more than local importance.

The raw material occurs only occasionally in real strata or nests. It is mostly a product, continually re-formed by the action of atmospheric air upon nitrogenous organic matter, in the presence of such bases as lime, magnesia, and potash. The organic nitrogen is not simply oxidised by atmospheric oxygen; the process of "nitrification" is accomplished by certain microbes. Whether the presence of ammonia is a necessary link remains an open question. The process of "nitrification" is much more intense in hot countries, where it is promoted by the abundance of suitable organic matter, and by the moist warm atmosphere. In Bengal, saltpetre is collected by a special caste of natives, the "Sora-wallahs" (salt gatherers), who scrape off the surface of the uppermost layers of soil which shows a white efflorescence. Davy gives as an analysis of Bengal earth 8·3 per cent. potassium nitrate. The earth is washed with water in earthenware dishes, or very often in pits dug in the ground and puddled with clay. The liquor is concentrated, very often by solar heat alone, and a crop of crude saltpetre thus obtained. From the East Indies there is annually exported about 25,000 tons of crude or rough saltpetre, about 10,000 tons of which come to the British Isles. This crude saltpetre contains a lot of impurities, principally sulphides, which are removed by a careful process of refining, leaving the refined saltpetre. The principal brand of English refined Bengal saltpetre is the well-known BRANDRAM'S B.B. brand, which is a remarkably pure and well-refined article.

Saltpetre is principally used in the manufacture of explosives, and for curing meat; while it is also used in medicines, as a flux in assaying, and for many minor purposes. A large quantity of saltpetre is now made on the Continent by artificial means. In this method nitrate of soda is decomposed with muriate of potash. The initiation of this process was due to the greatly increased demand caused by the Crimean War, and it is now carried on in a large way at Sassfurt, in Germany, where muriate of potash is found native to the soil. This artificially made saltpetre is used to a considerable extent for explosives; but does not seem to possess the qualities for curing purposes that the refined Bengal saltpetre is renowned for. Sal prunella is a concentrated form of saltpetre, obtained by thoroughly fusing and getting rid of any latent moisture, after which it is moulded into cakes of usually 2 ozs. and 4 ozs. each. It is preferred by some persons to saltpetre for use in meat curing.

Sardine Liver Sausage.—see Liver Sausage.

Saster.—see Westphalian Sausage.

Saucisse.—These are made the same as the Rost sausage, a better flavour being given by adding a little Rhine wine and lemon peel; but they must then be used at once; a little cardamom seed may be added. Stuff in sheep casings.

Sausage.—see Giant Sausage of Konigsberg.

Sausage Factory.—see Model English Sausage Factory.

Sausage Fillers and Stuffers.—There are a great variety of fillers in use, depending evidently more on the pattern longest employed in the district rather than the intrinsic value of the machine. We are now, however, removed a long way from the old-fashioned hand nozzle with wooden plunger—at least as far as the general large sausage manufacturers are concerned—and in up-to-date factories really high-class machines have, in nearly every case, superseded the various phases of old-fashioned ideas.

To the small sausage maker a cheap filler is all that is required, and his wants may be easily supplied by adopting one of the many patterns of light, iron-frame machines, with tinned, sheet-iron barrels.

The principle on which these fillers work will be readily understood from the illustration. The plunger is worked on a ratchet, which is propelled by a spur-wheel operated by the handle, the sausage material is placed inside the barrel, and is forced by the plunger through the nozzle in front. Before beginning to fill, the skin is soaked in luke-warm water, and pulled on to the nozzle with a small part left over the mouth of nozzle. When the sausage material is forced through it takes the skin along with it, the latter being guided by the finger and thumb of the operator.

On the Continent some very cheap fillers are in use, but these never seem to suit the English market. Whether it is because the German sausage maker is a more careful man, or the material they use is of a less resisting nature than what is used in England, the fact remains that machines that have a large sale on the Continent are altogether unsuited for our own market owing to their being so easily broken. On the other hand, however, many excellent fillers are made on the Continent, and one such is the upright pattern, as per Fig. II.

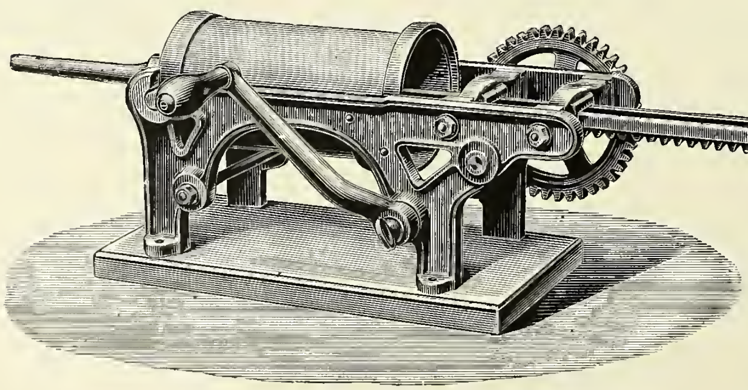


Fig. I. Light, Iron Frame and Tinned Barrel, Filler.

This pattern does not find favour in England; more because of the preconceived ideas of the horizontal type than anything else.

Of late years, cast-iron fillers, with porcelain enamel inside the barrels, have come greatly to the front, and, generally speaking, seem to give good satisfaction.

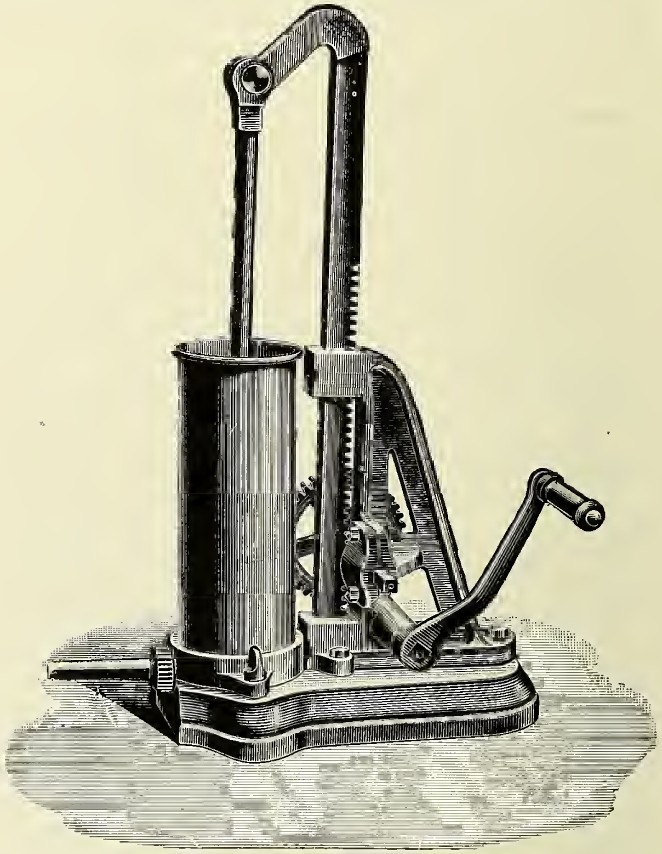


Fig. II. Vertical Pattern, Continental Filler.

Although the Continental pattern (Fig. II.) vertical filler has never taken well in this country other types of the upright pattern have, and the most popular of these is Fig. IV. These are very strongly made, the barrels being bored out true, while the plungers are accurately fitted to the barrel. As will be seen from the illustration, the plunger works from below, thus giving free access to the machine from the top. The sausage material can be thrown in with considerable force, thus ejecting all air, and the nozzles are fitted to the lid with a screw cap made of gun-metal, which is so constructed that different sized nozzles can be used with the same cap. The machine takes up very little floor space, and can be set at the end of a bench, or a portable table can be placed in front while the sausages are being made. From its construction, one or two pounds of sausages can be filled as well as the full capacity of machine, as the plunger can be set at any point of the barrel.

Large diameter sausages are still often filled with the old-fashioned American ham stuffer (Fig. V.).

Of course, in large factories, steam power machines take the place of hand machines, and a very good type of these

is the Alexander (Fig. VI.) made for both hand and steam power, but the popular vertical power filler is the strong heavy machine (Fig. VII.). The way to set up and use this machine is as follows:—

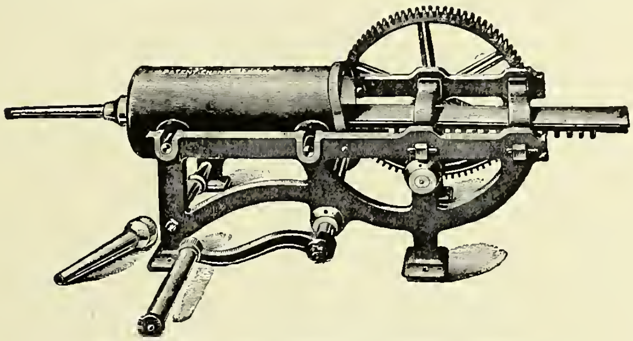


Fig. III. Filler with Porcelain Enamelled Barrel.

The machine should be placed at right angles to the shafting, so that the belt runs quite straight on the pulleys. The pulley, shown on illustration, is fixed to a worm spindle, runs continuously, and it is therefore necessary that the cog wheel, which corresponds with this spindle, should have a plentiful supply of solidified oil, which should be placed in lubricator.

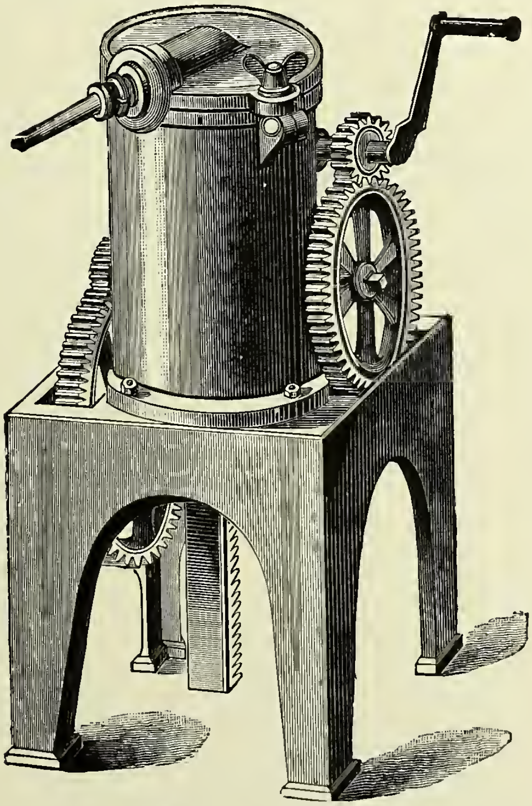


Fig. IV. Vertical Filler.

The pulley is calculated for 220 revolutions per minute. On the spindle of cog wheel is fixed on the other side of the machine, as shown in fig. "A," a small friction wheel "B," which, by the pressure on the foot lever "C," grips into the large friction wheel "A," the spindle of which carries a large cog wheel which, on its part, grips into a small pinion wheel, the spindle of which latter works the plunger bar.

If the machine is to be started, a light pressure on the foot lever "C" is sufficient to cause the friction wheel "B" to grip and start friction wheel "A." If the attendant wants to cease stuffing, all he has to do is to release the pressure on the foot lever, which causes the latter to rise (owing to the weight fastened to the other end of the lever), carrying the small friction wheel with it, and thus at once disconnecting the friction and the working of the machine. Simultaneously the brake band which lies round the large friction wheel is tightened, and stops the large friction wheel.

In course of time the brake band will stretch a little, and the very exact working of the machine will be slightly diminished, but this fault can at once be removed by a slight eccentric turn to the bolt, which is found on the right hand side when standing sideways before the machine. It is done in this way:—The nut which sits on the inside of the frame is loosened, the bolt is slightly turned downwards, and this done, the nut is tightened again on the bolt. The plunger bar, which pushes the plunger of the machine

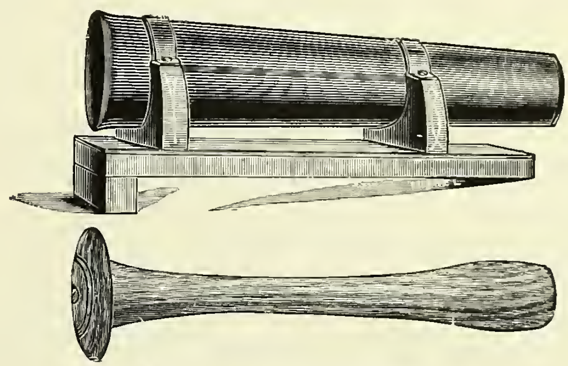


Fig. V. American Ham Stuffer.

upwards, is on the one side provided with a small arrangement which, as soon as the plunger bar has reached the top, presses against a feeler, and this pressure is transmitted to the foot lever "C"; thus automatically announcing that the machine is empty, that the plunger is close under the lid, and the machine has to be filled again. The seat is fastened by means of the screw, which is found in the framework beside the guard of the large friction wheel, but not too tightly, allowing the seat to move slightly, so as to give the attendant as comfortable a position as possible.

The advantages of this machine are:—No cog wheels are used for driving the machine. It is started and worked entirely by means of a worm wheel. The starting of the machine is so perfect, and the working so regular, that the bursting of the skins is made impossible. This end is attained by the two friction wheels working each other. The working of the machine generally is extremely regular, a result which could not be attained on any machine worked by cog wheels. The capacity of the machine is almost phenomenal, as it will do as much as two or three other machines put together. The new filler has the further advantage of not tiring the attendant, as a seat is provided for him from which he can comfortably work the machine. A slight pressure on the foot lever is sufficient to stop the machine at once, and the seat is made movable so as to suit any person. The drawback common to other large sausage stuffing machines, whether hand or steam power, necessitating a sort of second or subsequent stuffing after the machine

has been stopped, has been avoided in this new machine by an arrangement which, as soon as the foot releases the lever, makes the brake band act instantaneously, and by the expansion of the meat the plunger is forced slightly down again, thus relieving the pressure which otherwise would force the meat through the filler into the skins. The horse power required is ½ H.P.

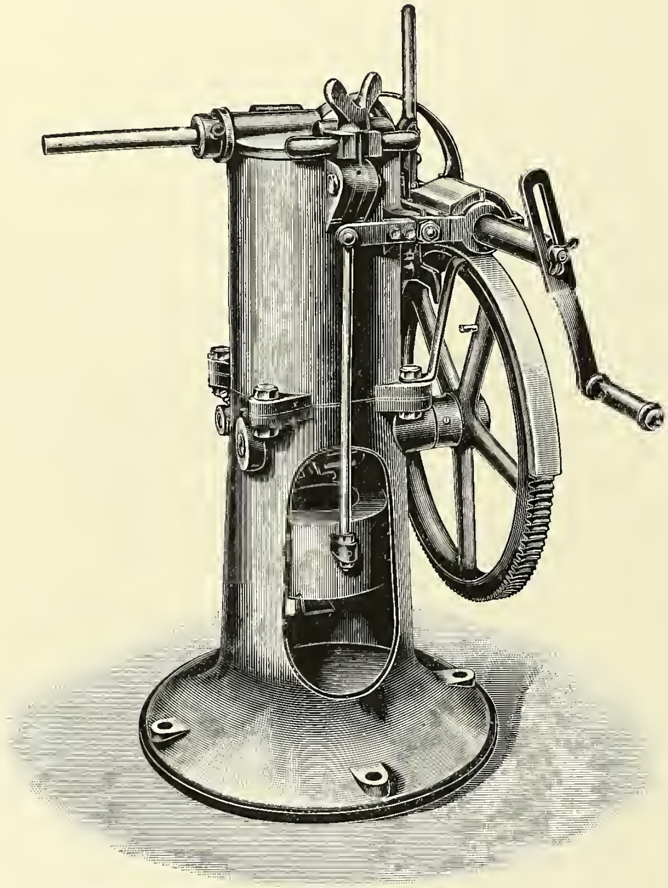


Fig. VI. Alexander Filler for Hand and Steam Power.

For wholesale work, the hydraulic sausage filler is probably the best that has yet been invented. As shown in the illustration (Fig. IX.), it consists (1) of hydraulic pumps, belt driven for accumulating sufficient pressure in a volume of water, to work the sausage filler; (2) of an accumulator in which a stack of iron weights takes the place of the "head," a long vertical column of water frequently made use of in hydraulics to give great pressure. The pumps force in water into a small reservoir against the pressure of the load of iron weights; (3) the filler is fitted with a hydraulic ram, which consists of a strong hollow cylinder closed at the one end, and having a gland packed with cup leathers at the other. In this gland works a piston, to the bottom of which is attached the plunger of the filler. The water under pressure in the small reservoir is conveyed by a pipe to the hydraulic ram, and a simple arrangement of cocks enables the operator to force down the plunger or to raise it up again; the real acting force being the great load of iron weights acting on the water. The arrangement works with the greatest ease and certainty, and several fillers can be served at one time.

One of the largest and most powerful stuffers is the steam power double American ham stuffer (Fig. VIII. page 338). If this machine is compared with Fig. V., some idea will be obtained of the relative powers of production.

It is capable of stuffing 8 to 10 tierces ham per hour. As will be seen from illustration, the machine has two cylinders, one for large and one for small pieces. It requires two men and a boy to work it. The ham is placed on the table of the machine, a place in the rear being provided for the boy to stand. He selects the large pieces and throws them into the one cylinder, and the small pieces into the other. A man at each cylinder places the casings on the tubes, and by operating the treadle with his foot, the plunger instantly forces the ham into the casing. The hinged lid of cylinder automatically closes whenever the plunger begins to go forward. One or other of the cylinders can be operated singly, or both together if desired.

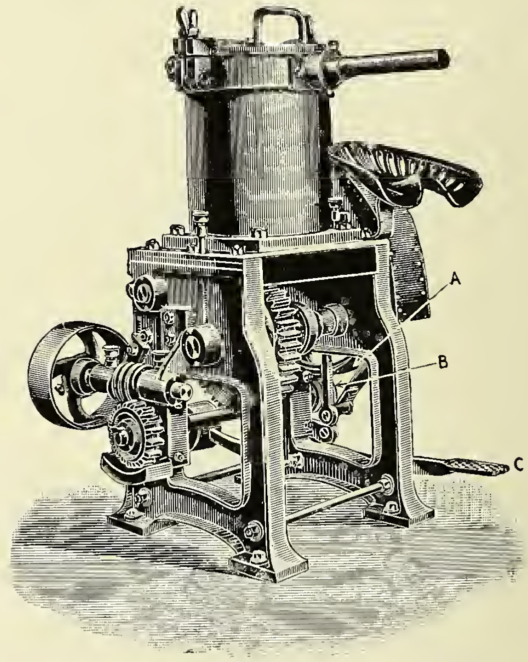
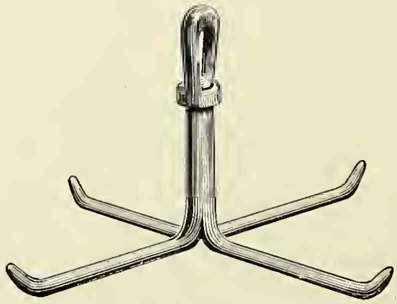


Fig. VII. Heavy Vertical Power Filler.



Sausage Hook.

Sausage Hook.—A four-armed hook for hanging linked sausages on. The ends of arms are blunt, so that they cannot pierce and spoil the sausages, which may readily be done when putting them on or taking them off in a hurry.

Sausage Making.—There are few industries in the United Kingdom which have made more rapid progress in recent years than sausage making, and the making of the numerous small goods so well known as associated with the business of pork selling. Only forty years ago the industry was almost unknown. At that time the common method

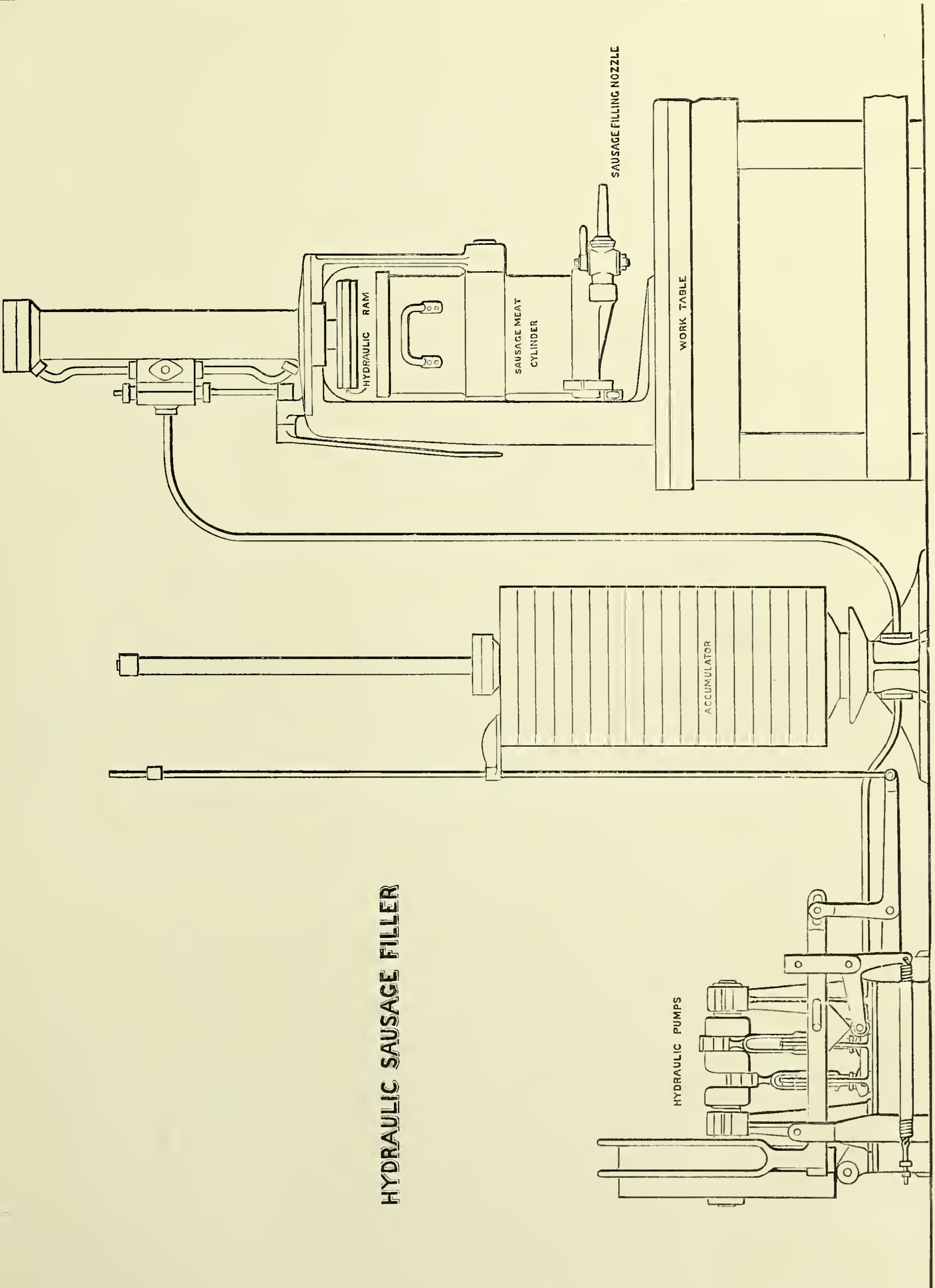


Fig. IX. Hydraulic Sausage Filler.

of manufacture was to cut the pork or meat into very fine pieces with a hand knife, mix the seasoning into it with the fingers, then insert the narrow end of a tinned iron tube—made narrow at one end and wide at the other—into the casing or skin to be filled, and proceed slowly to push the chopped mixture into the casing with the thumb, resting the tube between the second and third fingers of the left hand. At the present day that is all changed. The best skill and greatest ingenuity of engineers have been brought to the assistance of sausage makers, and the consequence is that the most beautifully designed labour-saving machinery can now be obtained, capable of producing sausages, in almost any quantity, from 20 lbs. to 2000 lbs. per hour.

men of irreproachable character, whose reputation for integrity was a sufficient guarantee to the buyers of their goods. These men, it was noticed, slowly but surely blossomed into men of substance; and it is a matter of common knowledge that businesses established on so secure a basis by a former generation are now to be found in London and many provincial towns. The concensus of opinion amongst the proprietors of these businesses would seem to indicate that factory labour, more especially the extended employment of female labour, has been of great assistance to them. It is reasonable to suppose that sausages being so easily cooked, only require the confidence of factory employées to make a large sale certain, as with

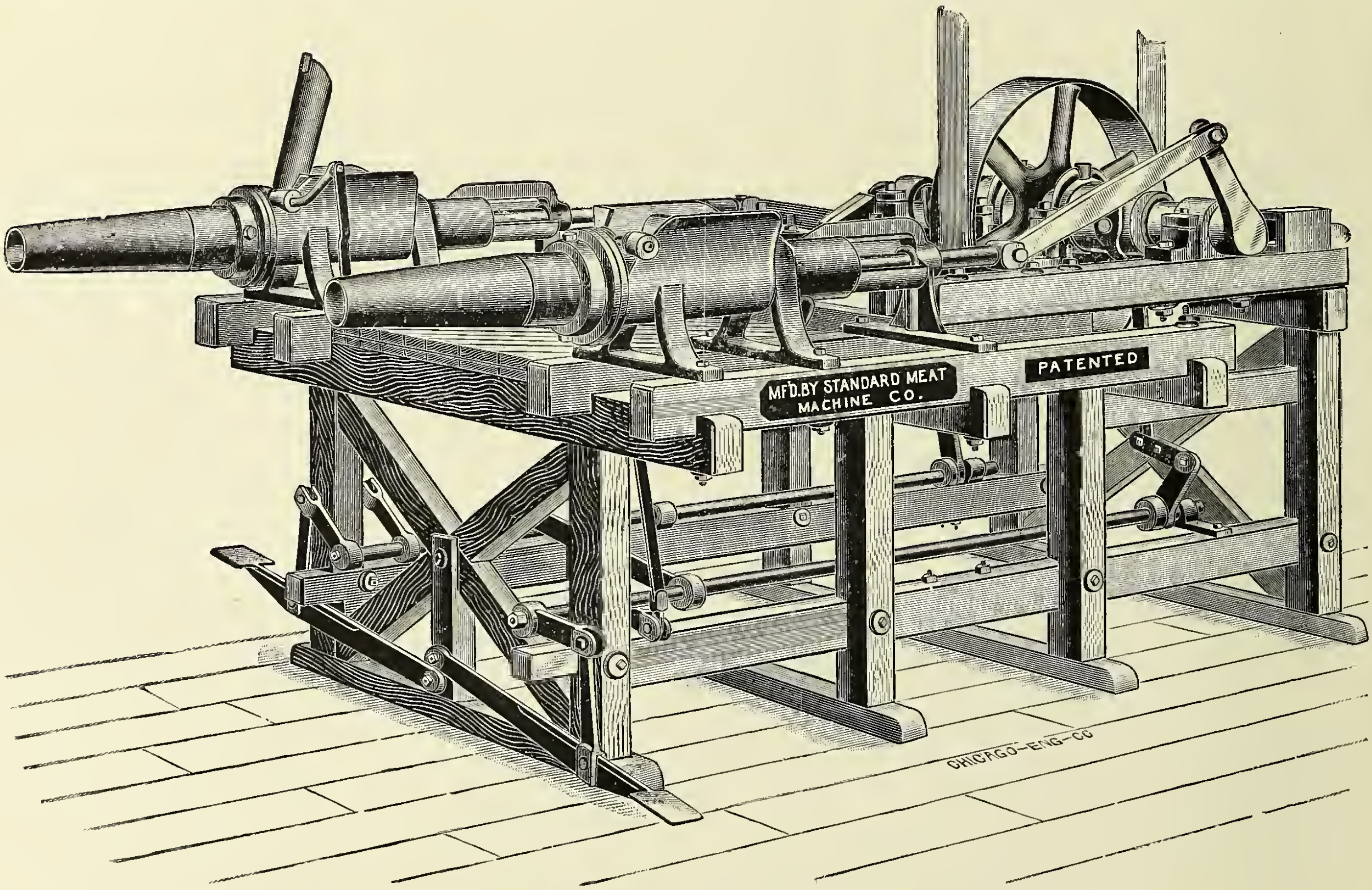


Fig VIII. American Power Ham Stuffer.

Of the early history of sausage making it is not proposed to say anything here, but it may be interesting to notice the causes which have led to the present satisfactory position of the industry.

It was commonly believed until within a few years since that sausage making was the last resort of beef and pork sellers, when they were unable to dispose of certain odd pieces of meat. Being unsaleable as pieces, the idea was common that they were carefully chopped into indistinguishable fragments, highly seasoned, and carefully concealed behind the "bags of mystery," as sausage skins were sometimes called. This notion was perfectly correct to a certain extent, in so far as it concerned some traders; but firmly established here and there over the country were to be found

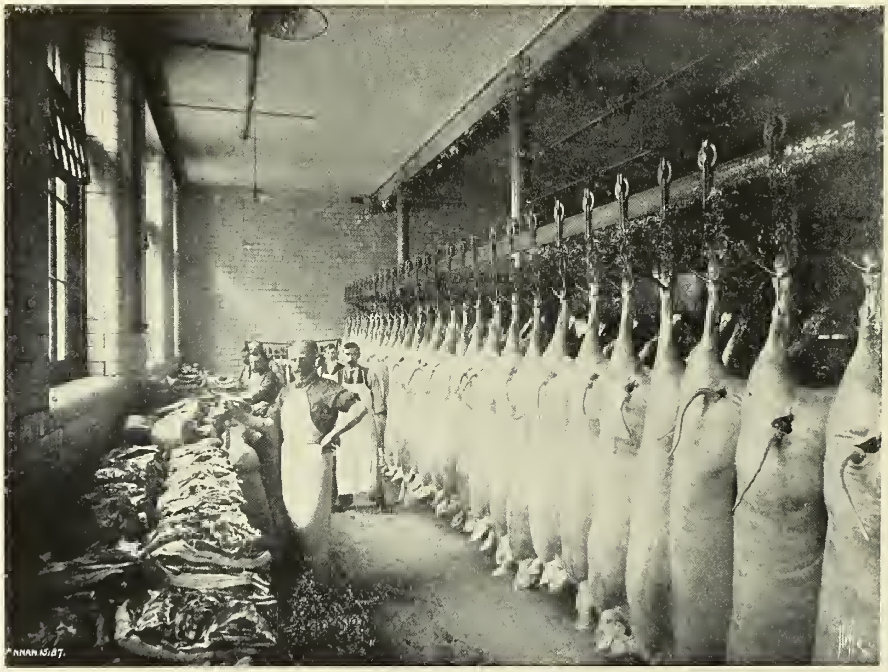
proper care and the exercise of a little skill in the preparation of seasonings they can be made very palatable. There is no question of their being nutritious, and compared with the prices of other foods they are certainly economical. In all food supplies, however, there is sure to be the inevitable cheap and nasty products offered in competition against the fairly priced and wholesome articles. Happily, the pork and meat purveyors who sell unwholesome goods are getting scarcer, as it pays better in the end to deal only in the reliable articles. Even now, however, the vigilant Food and Drugs' Act inspectors find it necessary to occasionally bring before the magistrates some delinquent. Not only do such traders destroy their own businesses but they injure the innocent, who are the great majority. The finest beef and

Meat Boning and Preparing.

Sausage Preparation and Filling.

pork are used now by respectable sausage makers in every town, and this is the reason why the public confidence has been gained; and, so long as purveyors do not abuse it, the increase of the sausage making industry in the future is certain.

A department of the pork purveyor's, which is now rising into prominence, is known as "small goods." Under this comprehensive term are included such articles as black-puddings, saveloys, Vienna sausages, German sausages, cooked hams, roast pork, savoury ducks, sausage rolls, boiled cabbages, boiled peas, and a few other things of smaller consequence. It is safe to say that this branch of the business has been very much neglected, and is capable of very great development indeed. There is nothing in this country corresponding to the artistic and savoury products of a French *charcuterie*. It may be objected that there is no taste for fancy glazed goods, artistically dressed hams, etc., here. But that idea has become entirely dissipated of late by the brilliant success of some pork purveyors, principally in London, who have made these goods specialities. The people to whom they are sold are not French residents in London, as may be supposed, but the better middle-class English families. Not only would such an adjunct be instrumental in bringing more business, but it would be very profitable in itself. From the artistic point of view such a development is much to be desired, as the attractiveness of shop windows would be very much increased, and there would be something to alter the unutterable, prosaic dullness which is characteristic at present.



Pig Hanging and Cutting-up Department. Portion of Meat Boneing and Preparing Room.

There are at present a very great number of machines adapted to the chopping of meat for sausages of more or less merit, but the ideal chopper has yet to be made. The fault of the best machines is that they heat the meat slightly during the process of cutting, and, therefore, superinduce fermentation when the meat is filled into the casings. This necessitates the addition of the powder "Food Preservative" as an antiseptic to prevent the ferment, or "souring." On the small scale, however, it is not necessary to notice this defect much, as the machines obtainable are well adapted to the production of meat in a normal condition, and it may be taken for granted that sausages made in the small way are seldom sent very long distances.

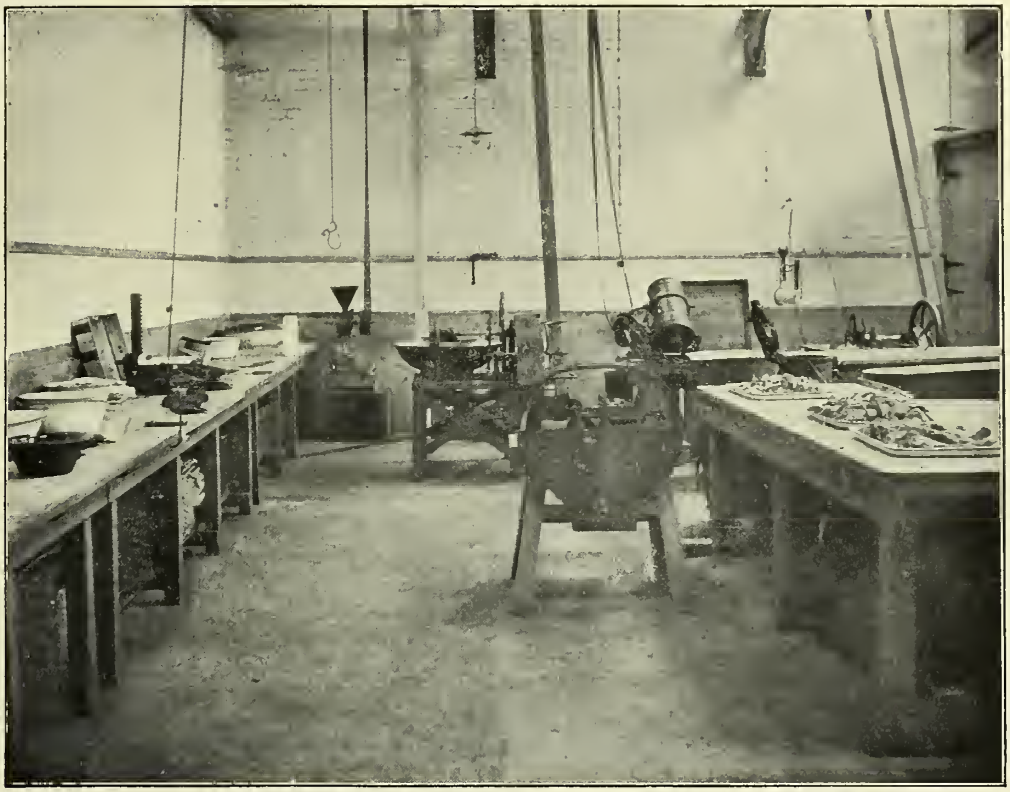
The whole business of sausage making in the United Kingdom has been revolutionised during late years. From a comparatively small industry to one employing thousands of hands has been the work of only half a century, and at the present moment there seems no limit to the developments which may yet be reached. Splendid factories for sausage making are now in existence, turning out many tons of sausages every week. The following description of a large Scottish factory will serve to illustrate the extent to which the business has been developed.

"Starting at the basement we find first of all a large cellar devoted to the curing of meats, and for this purpose a special refrigerator is located there. It serves to cool a space of about 3,000 cubic feet, and is also able to make about ten tons of ice weekly for use in the retail establishments. But this refrigerator is only one of three machines which, with eight chambers, are required to conduct the business of the factory. The curing itself is conducted on the wet system, by means of pickle of simple composition, and the curing arrangements are convenient and capable of turning out considerable quantities.

The first floor is devoted to meat hanging, boning, and cutting-up, and it will be seen from the illustration what quantity of raw material is handled. There are two refrigerating chambers on this floor constantly in use for cooling and keeping in prime condition the many tons of beef and pork which are handled daily. The second floor is occupied solely by the packing room, offices, and two general refrigeration chambers, which are cooled by ammonia machines. The packing is conducted in a very systematic manner, nine sets of weighing machines being constantly employed, and everything possible being done, by the employment of modern appliances, to effect a saving in time and labour.

With regard to the offices, they are handsomely equipped, as may be imagined. The telephone arrangements alone are an indication of the business done. Each of the shops—there are seventeen in Glasgow alone—is connected up to the head office by direct telephone, and the receivers in the offices are distributed in a number of little boxes, so as to permit of many messages being received or sent at one time. At the introduction of the telephone there was no such thing as a public company to contract with, and consequently the firm had to put up the poles and wires for themselves. This now is happily a thing of the past.

The sausage room occupies the greater portion of the third floor, and here immense quantities of sausages are handled, the filling machines being worked by hydraulic



Sausage Department of Modern Bacon Factory.

Two Sausage Chilling and Drying Chambers.

pressure supplied by the corporation. On this floor the firm has adopted a special design of refrigerating plant with the object of cooling and drying the sausages quickly and thoroughly. The work is performed in three insulated chambers, and the waggons carrying the sausages are wheeled in and out of these as required. Amongst the other departments on the third floor are the bakehouse and the seasoning rooms. The bakehouse is fitted with four large modern ovens, which are daily in use turning out vast quantities of various delicacies. The seasoning room is adjacent to the various departments where the many seasonings are wanted.

The fourth floor is a busy one, as here are arranged all the cooking pans and the operations of brawn making, black pudding making, potted meat, and other cooking are carried on. The enormous quantity produced shows the great favour in which these goods are held.

The fifth and sixth floors are occupied as general stores and for the preparation of special materials. On the yard level is a very completely equipped house, where are erected two large Douglas bone digestors, lard pans, and bone disintegrators, this department being one which is well worth looking after. Adjacent is a ham cooking house fitted out with Douglas's patent steam ham cooker. The main engine room and boiler house are on the ground level, and the power is derived from two boilers (a Lancashire and a multitubular), giving a total of about 150 horse-power. The engines are one of 40 horse-power, two of 20 horse-power each, and one of 8 horse-power. Of course, in such a large concern there are many auxiliary departments, such as dining rooms for the employees, repairing shop, carpenters' shop, etc.

Boiling and Cooking Department.

Vans ready to start deliveries.

The staff consists of several hundred employees, and it may be safely said that they have to be well qualified for their respective tasks, as nothing but high-class goods are produced in the establishment, and none but first class hands are wanted.

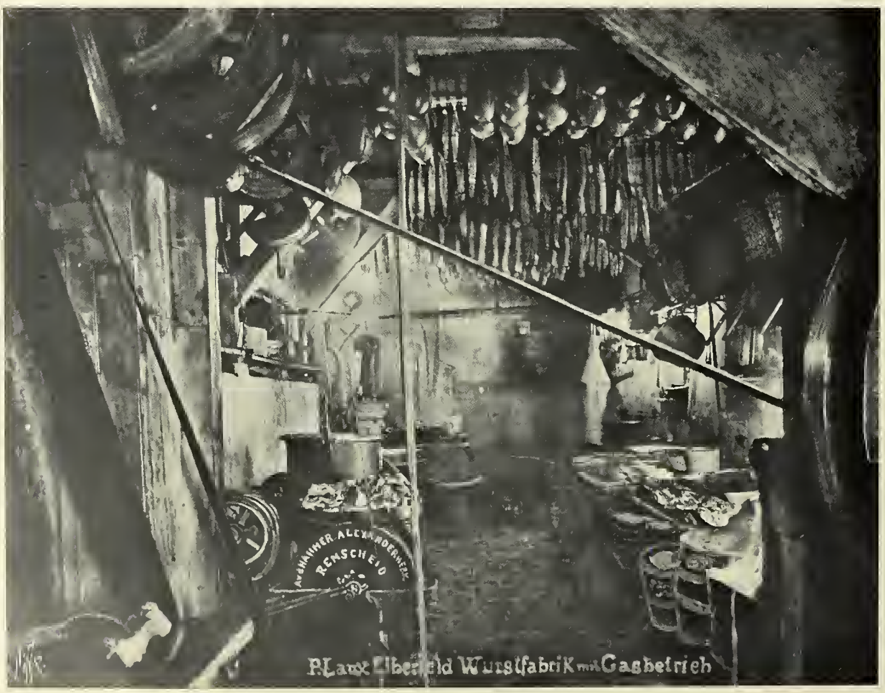
The goods made are in great variety, as the following list will show:—Pork sausages, Cambridge sausages, steak sausages, steak Cambridge sausages, tomato sausages, Blythswood sausages (for slicing), ham and tongue sausages, truffle sausages, boiling beef sausages, Frankfort smoked sausages, luncheon sausages, Yorkshire polony sausages, etc., etc. Meats in hermetically sealed glasses, prepared to keep, include spiced beef, spiced pork, spiced beef and tongue, Oxford brawn, chicken and tongue. The cooked meats are — Oxford brawn, spiced beef, spiced pork, potted meat in shapes, ox tongue (for slicing), roast pork, braised beef, veal ham and tongue, boiled bacon, Scotch haggis. Sundries include shoulder hams, lard in links, bladders, and packets, dripping, black puddings, white puddings, sweet

Bone Digestors, Lard Pans, and Bone Grinder.

Packing Sausages, Hams, and other Goods.

Alexander Cutter. Grindstone. Meat Trough. Vertical Sausage Filler.

Interior of a German Sausage Factory.



Interior of a German Sausage Factory shewing the various Sausages suspended from ceiling so as to mature.

Meat Trough. Alexander Meat Cutter. Spice Mill. Vertical Sausage Filler.

Interior of a German Sausage Factory.

Rocker Cutter. Vertical Sausage Filler. Meat Trough.

Interior of a German Sausage Factory.

puddings, plum puddings (in three sizes). From the cake and pastry department are turned out Blythswood pork pies of various sizes, mutton pies, sausage rolls, mince pies, mince cakes, apple cakes, sultana, Madeira, cherry, Genoa, seed, and ginger cakes. As will be seen, the handling of so many different perishable goods means that there must be rapid transport, and this is provided for in a fine stud of between thirty and forty horses.

Interior of Small German Sausage Factory showing Complete Equipment

The universality of sausage making makes one curious as to what is done in other countries, and enquiry will show that in Germany the business is developed much more highly than in the United Kingdom. The series of illustrations will serve to show how the business is conducted in that country. Of course, as our recipés show, the styles of sausage making are widely different, and the mere mumber far exceeds anything we know of. In fact, in Germany, sausage making is a recognised regular trade, having newspapers devoted to its interests, and being under regularly devised rules, such as would be in use in any other large industry.

Sausage Making in Denmark.—see Bacon Curing in Denmark.

Sausage Meal.—A special meal made from prepared biscuits, baked free from alum and other ingredients, which tend to make the sausage go sour. It is the most valuable ingredient used in sausage making next to the meat itself, as it holds the fat and moisture present during the process of cooking, thus enabling the sausages to be presented at table in a firm and good condition. The makers and inventors of this article describe it as follows:—"An absolute substitute for bread in sausage making, possessing a splendid flavour, free from sweetness, perfectly dry, and easily used, as it does not require to be soaked like bread. It can be used dry, with water sprinkled over the chopping. It holds the fat and water to about three times its own weight, and keeps both from running out when cooking, thus producing a firm, nicely-eating sausage. It does not sour, and in this particular surpasses all other ingredients used in sausage making." Other articles used in sausages are biscuit meal, rice, farina, corn flour, wheaten flour, pansitose, bread, and in short any flour made from cereals. Sausage meal takes a high place, however, because of the ease with which it can be applied. It is always best to use it dry, although some prefer to put a small quantity of warm water, equal weight, into it the night before using, and allow the same to become absorbed during the night, so that it can be used in the morning in a slightly damp paste.

Sausage Recipés.—see under:—

Bavarian Sausage.
Bayerskepolse.
Beef Sausage.
Beef and Pork Sausage.
Beef Cervelat Sausage.
Block Sausage.
Blood Sausage.
Boiling Beef Sausage.
Bologna Sausage.
Brain Sausage.
Bread and Butter Sausage.
Breakfast Sausage.
Brunswick Sausage.
Brunswick Cervelat Sausage.
Brunswick Sardine and Liver Sausage.
Brussels Mosaic Sausage.
Cambridge Sausage.
Cervelatpolse.
Coblenz Sausage.
Epping Beef Sausage.
Epping Pork Sausage.
False Liver Sausage.
Frankfort Sausage.
Frankfort Blood Sausage.
Frankfort Common Liver Sausage.
Frankfort Compressed Sausage.
Frankfort Fine Liver Sausage.
Frankfort Home-made Sausage.
Frankfort Meat Sausage.
Frankfort Smoked Sausage.
Frankfort Yellow Sausage.
Galantine.
German Sausage.
Goose Brain Sausage.
Goose Liver Sausage.
Ham, Tongue, and Chicken Sausage.
Knockpolse.
Leverpolse.
Leverpostej.
Limerick Sausage.
Liver Sausage.
Luncheon Sausage.

Sausage Recipés.—continued.

Sausage Seasonings.—These are compounded seasonings ready for use and can be had with, or without, salt. Those with salt are undoubtedly the best, as when newly ground spices are mixed with salt the fine aroma is retained. Many sausage makers do not sufficiently appreciate this fact. The oils of spices are very volatile, and when exposed to the air or kept for a long time in the ground state the spices become weaker and weaker, and a correspondingly larger quantity must be used to give the same flavour. Salt is very retentive and prevents this waste and thus, although seasonings were originally intended for small users whose trade did not warrant them in stocking the several spices separately, their unchanging quality has gradually broken down the prejudices of some of the very largest sausage manufacturers who now hardly use anything else.

It is a safe plan to buy seasonings only from firms of repute who grind their own spices, as the essential part of the manufacture is the blending the various ingredients as they come fresh from the mill. The usual list of seasonings on the market with the quantities required per 1 lb. of sausage material is as follows:—

Sausage Seasonings Complete—with Salt.

No. 1 for beef sausages (½ oz. to 1 lb. meat) plain or coloured.
No. 1 for pork sausages (½ oz. to 1 lb. meat).
No. 2 for beef sausages (1 oz. to 1 lb. meat) plain or coloured.
No. 3 for Cambridge sausages (1 oz. to 1 lb. meat).
No. 4 for Yorkshire Poloney Sausage (½ oz. to 1 lb. meat).
No. 5 for German or Bologna sausages (1 oz. to 1 lb. meat).
No. 6 for ham, chicken, and tongue sausages (½ oz. to 1 lb. meat).
No. 7 for black puddings (black pudding spice) (1 oz. to 14 lbs. pudding material).
No. 8 special plain seasoning, without spices (½ oz. to 1 lb. meat).
No. 9 for pork pies (½ oz. to 1 lb. meat).
Liver Sausage Spice.

Sausage Seasonings without Salt.

No. 1 for beef sausages (¼ oz. per lb. of meat) plain or coloured.
No. 1 for pork sausages (¼ oz. per lb. of meat).
No. 2 for beef sausages (½ oz. per lb. of meat) plain or coloured.
No. 3 for Cambridge sausages (½ oz. per lb. of meat).

It cannot be too distinctly understood that it mainly depends on the seasoning whether goods get a ready sale or not. The ingredients in seasonings are numerous and there is undoubtedly an art in properly compounding them.

Sausage Varnish.—see Polselak.

Sausage Seasoning (a plain recipé).—A plain sausage seasoning suitable for most kinds of cheap goods such as 1d. polonies, saveloys, black puddings, savoury ducks, etc. Of course it is only a seasoning of pepper and salt. Judgment must serve the sausage maker in the addition of spice, herbs, etc.

Seasoning— 2 lbs. salt.
1 ,, pepper.
½ oz. cayenne pepper.

3 oz. of this to every 10 lbs. meat; add 1 oz. preservative to every 10 lbs. in winter, and 1 oz to 8 lbs. in summer.

Saveloys.—Saveloys are made from various common meats, and are the vehicle by which returned sausages are very often worked up. Such ingredients also as lights with any inferior salted pork are sometimes added, with anything else that would not sell without being chopped up. Thus it happens that occasionally some unscrupulous sausage maker adds unwholesome meat, and is called to account for so doing. It is quite possible to make a cheap saveloy out of wholesome food without introducing that which is not so.

16 lbs. beef.
4 ,, fat.
8 ,, pressed bread.
4 ,, sausage meal.
2 ozs. food preservative (dry antiseptic).
16½ ,, seasoning.
1 ,, saltpetre.
3 ,, smoke powder.
¼ teaspoonful Armenian Bole (No. 1).

Seasoning Recipé.—9 lbs. salt.
6 ,, white pepper.
4 ozs. ground coriander seed.

Cut the meat and fat into small pieces and mix the bread with it. Put the whole through the meat cutting machine slowly, adding the sausage meal and some water. Add the other ingredients and chop the whole very fine. Fill into wide pig casings, smoke in oven for a few hours, and cook for forty minutes at a temperature of 200° Fahr. It is not necessary to smoke them unless to dry them, as the brown dye that is used for German sausages will give the necessary colour. Use it exactly in the same way as for Germans. The addition of some liquid from boiled pork rinds is said to be a great improvement; to be added when the mixing is nearly complete in the machine. The colour also may be heightened by the addition of a little poloney dye to the water in which they are boiled.

Savory.—see Culinary Herbs.

Savoury Ducks.—These articles, sometimes named "spice balls," "spice nuts," or "faggots," are made from the general fragments of a pork establishment. If stale bread can be obtained cheaply it is mingled with the fragments and seasoned, thus producing the savoury duck. Perhaps nothing is of so very great advantage in a pork business than this commodity, as it allows of the working up of lungs of pigs, etc., which would otherwise be wasted.

Recipé.—10 lbs. lungs.
6 ,, scraps of meat, pork, etc.
5 ,, stale bread (ground up) or sausage meal.
3 oz. food preservative (dry antiseptic).
½ lb. chopped onions.
12 oz. seasoning.

Seasoning.—1 lb. black pepper.
½ oz. cayenne pepper.
1 ,, rubbed sage.
1 ,, ,, thyme.
¾ lb. salt.

Keep this seasoning in tins, tightly covered up and ready for use.

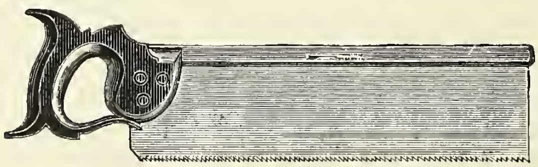


Fig. I. Back Saw.

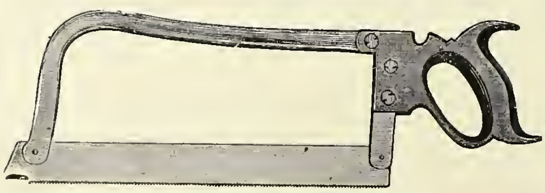


Fig. II. Bow Saw.

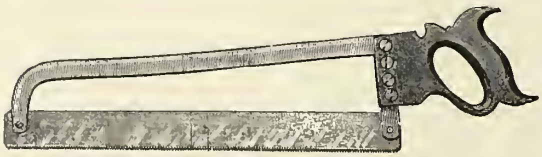


Fig III. Bow Saw.

Saws.—These are made in different styles, but the saws in ordinary use are the back saw (Fig. I.) and the bow saws (Figs. II. and III.). The illustrations are sufficient to explain how these different makes are of service to pork and meat butchers.

Scalding Tanks.—see Pig Scalding Tanks.

Scales.—see Weighing Machines.

Scissors.—see Cattle Marking Scissors.

Scoop.—see Lard Renderers' Tools.

Scotch Haggis.—see Haggis.

Scrap.—see Lard Rendering, as practised in Wiltshire.

Scrapers.—see Block Scrapers, also Pig Scrapers.

Scuttling Table.—see Abattoirs.

Seasonings.—see Sausage Seasonings.

Sheep Casings.—The best sheep casings are produced in England and Holland, and the best market for both is in the United States. The Colonies produce a large quantity. Victoria casings are of medium size and good, New Zealand strong, and of convenient size, Canadian fairly good. South America and Russia also produce a large quantity. The usual method of putting up Russian skins is in rings about three inches in diameter, and ninety to one hundred feet in the ring. Russian salt contains a large percentage of lime, and rather spoils the skins in consequence.

Sheep casings are used for Vienna (Weiner), Frankfort, Bratwuest, and beef sausages. The length of the intestine of the sheep is from twenty-eight to forty yards—about one-half being wide, while the remainder is medium and narrow. The filling capacity of the narrow casing of a sheep is about twenty lbs. of meat The best casings come from animals from three to six years old; and these should stuff sixty lbs. to seventy lbs. of meat to one lb. of casings, and tie into sausages holding about four ounces each.

American sheep casings are mostly twisted into strings for different purposes. The process of preparing these is similar to the process through which sausage casings go, viz., they are thoroughly scraped and cleaned until all the fatty matter and fibrous tissues are removed. While in the United Kingdom this operation is done mostly by hand, in America it is mostly done by machinery. A machine consisting of a drum, which is turned by a handle or by steam-power, a set of forks for separating the gut, and an arrangement of blunt knives, over which the casings are drawn by the revolving drum, being the usual apparatus. When the gut is to be spun, it is carefully kept in clean water which has been charged with antiseptic. Violin strings are the main outlet for this class of gut, and the operations in manufacturing these may be briefly summarised as follows:—The gut is split in two by a sharp blade fixed in the table towards which the strand is carefully guided by the expert fingers of the operator. As the strands must be cut uniformly, only practised hands can do this part of the work. These strands are then spun together, and held on frames to dry. Violin strings have as many as six strands spun into them. When the spun strings are thoroughly dry, they are taken off the frames, cut into the required lengths, and packed in oiled paper ready for marketing.

Sheep Dogs.—Among the many breeds of dogs, only two varieties need be mentioned here as being of special service to man, viz., the rough-coated collie and the old English bob-tailed sheep dog.

It would be difficult to over-estimate the marvellous intelligence of a good collie; he thinks and acts for himself under difficulties and conditions both new and puzzling, and in matters appertaining to his special duties rarely fails to strike out the right course. It is a matter for admiration the way in which a collie accommodates himself to both country and town, as those of us who have watched him under both conditions can testify. The animal that seems to be born for the difficult work on the mountains of Scotland and Wales, is equally intelligent in the complicated thoroughfares of the metropolis. Instances innumerable could be given of the collie's cleverness, and fidelity to his trust and his master. That, however, is not so much the scope of this article; but a fact vouched for by one author may be given, where, it is asserted, that a drover by a mere wave of the hand could send his collie back home from Smithfield to the Highlands.

In general appearance the collie is clear and distinct from any other of the domestic breeds. His build should be light and graceful, full of bone and muscle, with no superabundance of flesh to cumber him. His style and carriage should be elegant in outline and graceful in movement, with a combination of wisdom and self-reliance, toned down by an unswerving loyalty and love for his master.

In a show dog the coat is always profuse, with an immense frill encircling the neck. In a working dog there should be no waste or lumber; the coat, though heavy-looking, is not really so, but is essentially wet-resisting, and a necessity for him in his exposed existence. No dog excels the collie in good looks. The chief points are as follows:—The head should be in proportionate size to the body, although it usually looks small because of the superabundance of ruffle in the best specimens; the skull should be broad and flat, slightly narrowing towards the front; the teeth should be strong and white, and meet equally without being undershot; the eyes should be pretty close together, and be well set forward, the colour varying with the colour of the coat, but generally a shade of brown; the ears are invariably thrown back, with their tips embedded in the thick frill as the dog bounds along, and well pricked up when on the alert, but should drop immediately the dog becomes still; the shoulder should have a decided slope, and be well provided with plenty of elastic muscle; the chest should be deep, but if too wide is indicative of a slow and laboured pace; the back should have long but supple

The Collie.

deep fore ribs, and rather shallow back ribs; the loin slightly arched, with a gradual droop from the hip bones to the set of the tail; the fore legs straight and muscular; the hind legs well bent, with strong and muscular thighs. The coat is of the greatest importance, and one of the characteristics of the breed; it consists of an outer long, comparatively thin lot of hair of hard useful texture, and an under jacket of very thick close soft hair of a woolly texture. The two combined are impermeable to rain, and even to a Scotch mist of a reasonable sort. In the matter of colour, black and white, with more or less of tan, predominates; but in recent years the leaning has been more to white and orange. The tail should not be set on too high, but of fair length, and not quite equal to the dog's height at shoulders; carried well up and curved, but never curled over the back, as with the pomeranian.

The Old English Bob-tailed Sheep Dog is the colleague of the collie; and we are indebted to a breeder of very high-class dogs for the accompanying illustration.

Confusion appears to have arisen in the minds of many as to every dog with a docked tail being of the correct breed, but this is not so; the genuine stock is of such a pronounced type that a mistake need not occur in distinguishing the different varieties. At one time dogs without tails were exempt from taxation, and this undoubtedly has led many to form an erroneous impression of the English drover's dog. The temptation to cut off a dog's tail was great; and while it has been asserted that the animal of to-day has become tailless by a system of docking his progenitors through generation after generation, we take leave to question the soundness of the argument, as the bob-tailed sheep dog has clearly-marked features which separate him from the promiscuous herd.

The Old English Bob-Tailed Sheep Dog.

In appearance the bob-tailed dog differs widely from the collie. He is square-built, short-backed, bull-necked, with a rounder head and truncated muzzle; the coat is long and very shaggy—more or less curly in some instances, but much better when straight—the colour being black and white, grey or grizzled; the face, unlike the collie, is more or less rough or bearded. A peculiarity of this dog is his habit of running over the backs of the sheep when in flock, in order to head them, and on that account he is invaluable. Of

course, this peculiarity can be trained into some collies as well, but the bob-tail seems to take to it naturally.

The chief object of breeders should be to avoid the show dog, and encourage animals of the size and intelligence best suited for the performance of their natural work. A large dog may have a grander and more imposing appearance, but excessive size is a disadvantage, and for this reason no better dog can be bred than the old bob-tail.

Feeding is a most important point, as it is absolutely necessary that a judicious selection of animal and vegetable food should be given to keep dogs in good health. Careless feeding very often turns a fine specimen of a dog into a mis-shapen brute. The food should be thoroughly cooked, more particularly when it is of a starchy nature, as badly-cooked food means imperfectly digested nourishment and consequent ailments, such as diarrhœa, etc. The most portable food for dogs is what are known as Buffalo Meat Biscuits,—one or two can be carried in the drover's pocket when away from home, and at home may be mixed with broth made from butcher's trimmings, etc. Green vegetables are of great advantage when boiled and added to the food. Oatmeal when properly cooked is perhaps the best of all foods, but it should in all cases be made with broth and formed into a stiff pudding, and allowed to stand until it is cold. Maize meal is frequently used owing to its cheapness, but it is anything but an ideal food for dogs, and is very often to blame for many skin ailments. When more meat is required in a portable form, a new dog food called Melox may be used with advantage. It is a granulated food, highly nutritious, and much liked for brood bitches, or puppies after weaning. In fact, one meal of Melox daily with any other food that may be adopted, is an ideal diet for a healthy dog.

Sheep in Cape of Good Hope.—see Cape of Good Hope.

Sheep in Natal.—see Natal.

Sheep in New Zealand.—see New Zealand.

Sheep in Nova Scotia.—see Nova Scotia.

Sheep in South Australia.—see South Australia.

Sheep in Tasmania.—see Tasmania.

Sheep in United Kingdom.—see Live Stock Returns.

Sheep in Western Australia.—see Western Australia.

Sheep Scab.—The Board of Agriculture, in a leaflet issued in October 1899, gives the following information :—

Sheep scab in this country is a purely contagious disease, affecting the woolly parts of the body, and due to the presence on the skin of a species of mite or acarus called *Dermatodectis ovis*, but sometimes *Posoroptis communis*. Parasites very similar in form and size are also found on the horse, dog, and other animals, producing the disease commonly called mange, but the mange acarus of the horse, dog, or other animals does not produce sheep scab. It may therefore be accepted that where sheep become affected with sheep scab they must have previously been in contact with diseased sheep, or with tufts of wool left by diseased animals on fences, posts, hurdles, or other objects against which the animals have rubbed. Although the usual symptoms of sheep scab are known to most flock masters and shepherds, it may be well to refer to them in this leaflet.

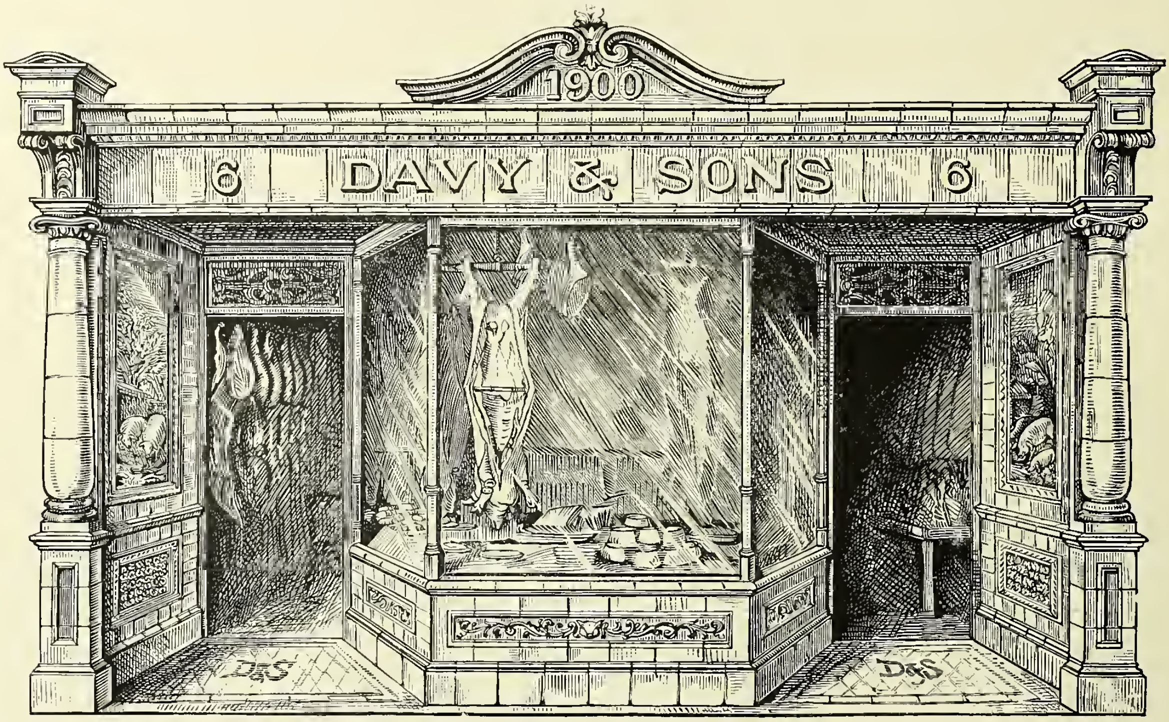
One of the first symptoms apparent in a sheep that has contracted scab is restlessness on the part of the animal, and a desire to bite the infected part or to rub against posts, fences, hurdles, or other members of the flock. This restlessness is the result of the irritation and itching produced by the mites pricking the skin of the sheep in their endeavour to obtain food, and as they increase in number, the constant biting and rubbing of the sheep to allay the irritation causes injury to the skin, which is followed by an exudation of serum, and the formation of crusts or scabs, under the edge of which the parasites and their ova are to be found. As the acari or mites increase in number they move from beneath the scabs to the more healthy parts of the skin, and thus extend the area of the disease. The injury to the skin produced by these mites is followed by falling of the wool, and the fleece becomes broken and tufted, or matted together, giving the animal a ragged appearance.

As soon as a sheep is found to present the above symptoms the owner should at once examine the animal, and, if he has any doubt as to the nature of the disease, call in the assistance of his veterinary adviser to discover whether the itching and rubbing are due to the presence of the sheep scab or another parasite, or other causes.

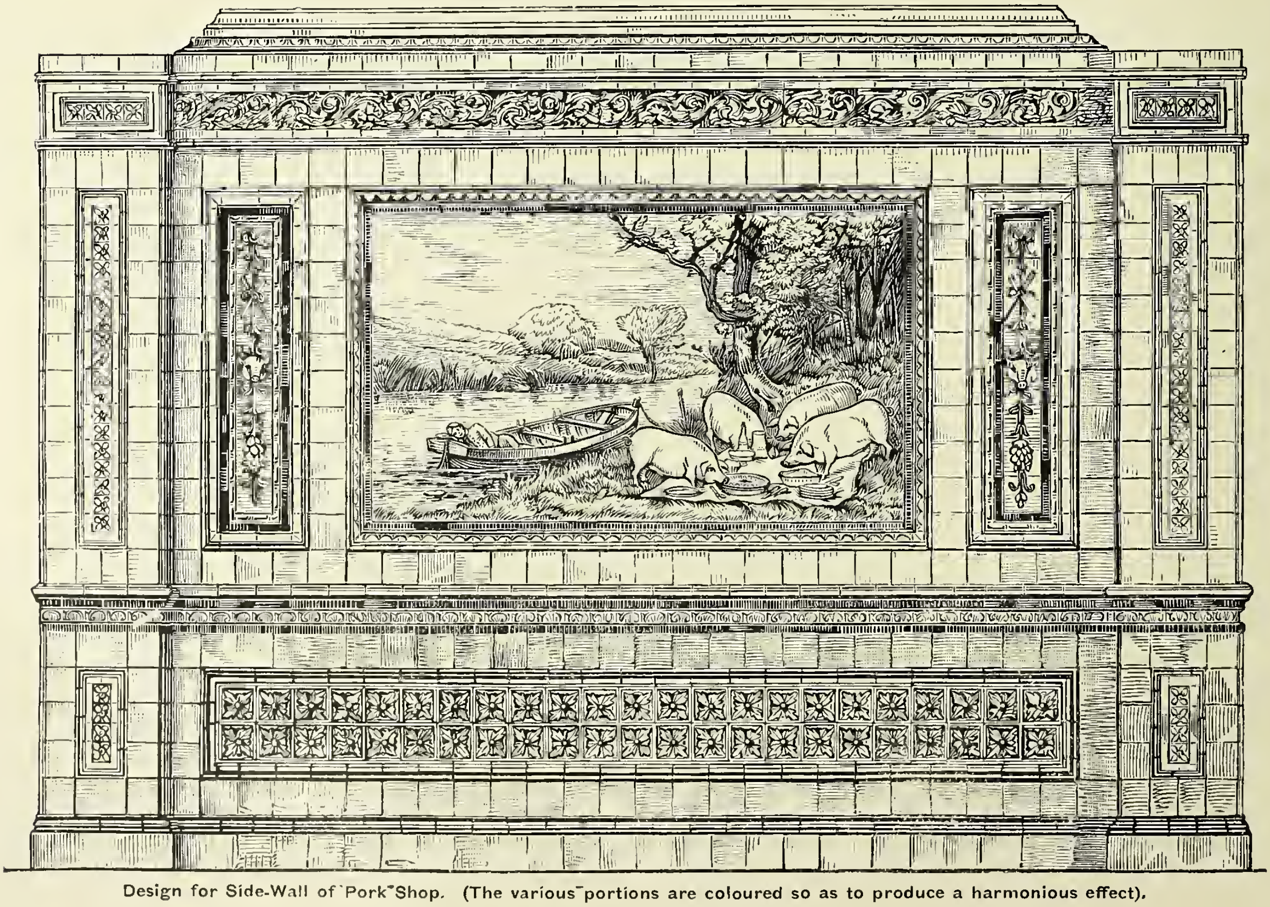
The most convenient method of examining a piece of wool or crust taken from a suspected case of scab is to spread it out upon a dark surface, and place it in the sun or any other warm position, when the acari will be seen as small white specks moving about on the wool, or perhaps on the surface beneath it. These moving objects should then be examined with a pocket lens or with a microscope having an objective of low power (one inch will be sufficient). The parasites and the ova are usually abundant in the crusts or scabs on the surface of the skin, and if a small portion of the crust, after being softened in a mixture composed of glycerine and a solution of potash or soda, is teased out and placed upon a slide there will be found, in confirmed cases of scab, whole acari, portions of the detached legs, and ova mixed up with the fibres of the wool and fatty matter.

It has been stated that the parasites of sheep scab may be easily seen by the naked eye, and there are some whose experience enables them to easily do so, but now that the decisions of the Veterinary Inspectors of Local Authorities in Great Britain are followed by serious consequences to the owners if their sheep are certified to be affected with scab, it is most important that no errors should be made in diagnosis. It therefore becomes necessary that all enquiries into reported outbreaks should be conducted on the above lines, because, unless the particular acarus or some of the ova can be discovered, the disease cannot properly be declared to be present.

Since the life history of the sheep scab parasite has a very important practical bearing upon that part of the sheep scab Order of 1898, which deals with the dipping of sheep, it should be explained that the mature female after having laid from fifteen to twenty-four eggs dies, and the eggs are hatched in about seven days, the young parasites becoming sexually mature in about eight days, and another generation of eggs being laid fourteen or fifteen days after the first. Effective dipping with a suitable dip kills the acari, but may not destroy the vitality of the ova. It will thus be seen that



Design for Pork Shop with two doors.



Design for Side-Wall of Pork Shop. (The various portions are coloured so as to produce a harmonious effect).

not only do the acari rapidly multiply, but that it is necessary, if the disease is to be completely eradicated from the flock, that the sheep should be dipped a second time not later than the fourteenth day; for whilst the first dipping might have killed all the acari, their ova may not have been destroyed, and hence a second dipping becomes necessary to kill the produce of these ova.

There is another parasite which is frequently to be found in the wool of sheep, viz., the common tick, or *Melophagus ovinus*. This creature differs very materially in size and form from the sheep scab parasite, but as it often produces irritation of the skin, accompanied by constant rubbing, which is also a usual symptom in sheep scab, it has been considered desirable to call attention to it, in order to guard against errors in diagnosis. Where these ticks are numerous and causing much irritation of the skin, it may be desirable to dip the sheep once with the same solution as for scab.

Sheffield Poloney Factory.—see Model English Sausage Factory.

Ships fitted for the Irish Butter Trade (written September 1900).—*s.s. "Glengariff" and "Kenmare."*—For years past it has been apparent to observers that unless something were done in the way of providing butter carrying vessels with refrigerating plant on board for the Irish trade it must suffer very much. The Danish shippers have long been alive to the advantage of refrigerating machinery on their ships, and have many splendidly equipped vessels plying between Danish and English ports. The advantage has been so great of late years that the firm, nicely textured butter of Denmark which arrives in summer has fetched as much as ten shillings per hundredweight more than its Irish rival. The Irish butter has been landed in England and at Scotch ports in a state of semi-fluidity due to the fact that the holds vary in temperature from 65° to 85° Fahr. Now, in Ireland, the shippers have gone to a great deal of expense to equip themselves with refrigerating machinery.

All over the south of Ireland it may be safely said that butter can be produced and sent off for shipment to England in first-rate order, firm and granular. But this would be useless if the vessels for carrying it were not equipped with refrigerating plant so as to continue the same conditions throughout. It has been left to the enterprise of the City of Cork Steam Packet Company, Ltd., to take the lead in providing the facilities required. They have had equipped the two splendid screw steamers *Kenmare* and *Glengariff*, plying between Cork and Liverpool, and in all likelihood the success of this initial step will lead to fitting out some of the same company's fleet plying to other English ports.

The space cooled in either case is about 18,000 cubic feet, and the machines themselves are placed in the main engine room, as is usual with this type of machine, because the refrigerating agent used does not give off any noxious vapours. This arrangement has the double advantage of not reducing the space available for cargo, and requiring no increase in the staff as would be necessary where a separate engine room is required. They are on the patent carbonic anhydride system, and are employed in cooling brine to a low temperature, which is circulated by means of a pump attached to the machine through brine pipes placed overhead in the cold chambers, which, in turn, cool and dry the air, and, therefore, the goods placed therein. These pipes are made on a patent system, being bent into the form of grids, and electrically welded at the joints, so that there is only one joint for every 100 ft. or so, which compares favourably with the ordinary system of piping ships.

The insulation of the cold spaces is carried out on somewhat novel lines. Instead of multiple layers of tongued and grooved boards and charcoal, with which the holds of vessels fitted with refrigerating machines are usually lined, something of a much lighter and more economical and equally efficient type has been devised, consisting in filling in the space behind the cargo battens, which have been made solid for the purpose, with washed cow hair, a material which has the greatest insulating properties, is extremely light, and owing to its nature will not escape in the form of powder through a narrow crack as would be the case with charcoal.

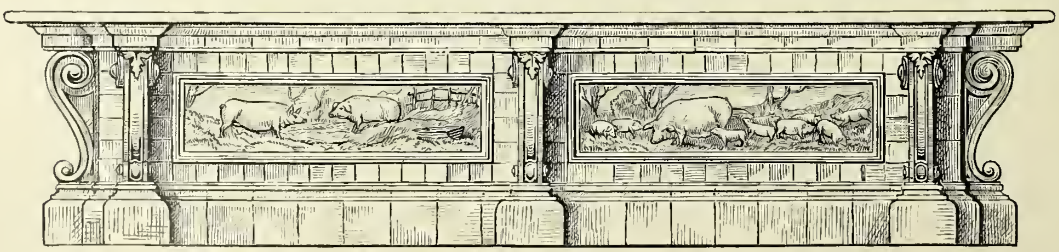
The chain of refrigeration between Ireland and England is now complete. As has been noted, the merchants have their stores fitted with refrigerating plant, the ships are refrigerated, and the refrigerated stores in England are legion. The butter merchants, therefore, have the very best possible conditions under which to conduct their trade, and it will be their own fault if any continental country supplant them in the English market.

Shop Fitting.—Modern pork, meat, and provision shops lend themselves to much ornate design. Wherever, indeed, meat or food of any kind has to be handled the surroundings should always be handsome if possible, and always clean. Thus it is generally accepted that tiling is more applicable to the lining of such shops than to any other, inasmuch as it does not readily harbour dirt and is at all times easily cleaned. When tiling is adopted the general surroundings should be in keeping, the counter and window slabs should be of white marble, and the rails polished. A very effective style of rail is the plated kind. Especially in artificial light they always look well. The floor of a shop so fitted can be laid either with mosaic work or some impervious material of similar character. The colouring of the tiles should be carefully studied, so that, when they are fixed, they will blend. Nothing can be more unsightly than badly blended colouring in tiling.

Plenty of height and light are essential in every shop, and free ventilation. When the walls are complete the next consideration ought to be the fittings. These should be regulated entirely in accordance with the character of the shop. A cheaply got up place need only have a few bars, a counter, a block, and the usual tools. A more elaborate place, such as is shown in the design, "A Model Pork Shop," wants a great deal of consideration, and it is really a work of art carrying out the successful fitting of such a place. The bars should be highly polished or plated throughout. The timber fixings should be of either teak or similar wood—French polished. The lights, if electric, should be highly ornamental. There should be a handy refrigerator for keeping small portions of meat, etc., and also a counter refrigerator with glass sides. The blocks should be of the American or French makes, mounted on ornamental stands, and all the scales and tools should be of finest finish.

In the ordinary shops, where the business of manufacturing sausages and small goods is carried on, the rear premises will contain the work-shop and the basement the cellar. The workroom fittings will entirely depend upon the trade,

A Shop lined with Encaustic Tile Work and with White Marble Slabs.



Design for, Pork Shop Counter in Coloured Encaustic Tiles and White Marble Top.

and may be varied *ad libitum.* The cellar of such a place may now be fitted very easily and cheaply with a refrigerating machine at small cost (see refrigeration). Perhaps the

A Model Pork Shop—Exterior View.

time has now arrived when thousands of pork and meat shops will adopt refrigeration for themselves. So far, the price has been prohibitive, but now it is within the reach of three-fourths of these trades.

Shrinkage in the Weight of Bacon, with special reference to other matters affecting the cost of provisions.

The following paper was read by Mr G. R. Hawthorne, at a meeting of the Northampton Grocers' Association, May 1901 :—

Before entering upon the difficult task of calculating the loss caused by the shrinkage of weight of most of the goods handled by the provision dealer, I should like to be permitted to point out how easy it is to fall into an error in calculating goods that do not lose in weight. For instance: 30 eggs sold at 3 for 2d. equals 1s. 8d.; 30 eggs sold at 2 for 2d. equals 2s. 6d.—total, 4s. 2d.; and as 3 for 2d. and 2 for 2d. apparently equals 5 for 4d., if the eggs be sold at this price, *i.e.*, 5 for 4d., they would only make 4s., and thereby show a loss at the latter rate of selling of 2d., or roughly 4 per cent. Another instance that does not apply exclusively to our trade, but I think still goes to show how very careful we should be, as I think it is much more simple and misleading than the one previously referred to. It is as follows :—A gentleman left a sovereign in the hands of two trustees to be divided amongst the poor of a village. The first year they gave 1s. to each of 20 persons, equals £1; the next year they gave 6d. each to 40 persons, equals £1. The following year they decided that 40 was too many, and 20 not enough. so they divided (equally as they thought) the number of persons and the amounts previously given, viz, 30 persons, the half of 20 and 40; and 9d. the half of 6d. and 1s., but before they came to the thirtieth recipient of 9d. they found that to give thirty 9d. each they would require £1, 2s. 6d. (They should have given 8d. each to 30.) I have only referred to the foregoing examples to show how easy it is to miscalculate, at a fixed number and a fixed price, and I submit that it is much more difficult to calculate the cost of an article whose shrinkage in weight cannot be definitely computed, and as an instance of this let me cite the following :—A parcel of bacon was smoked in two lots; one lot came out of the smoke house showing a loss of 1s. 10½d. per cwt. more than the other. Some may probably say that it is very easily accounted for, because that which was smoked first would be sure to lose the least; but

A Model Pork Shop—Interior View.

such was not the case, for the lot that was smoked first cost the 1s. 10½d. per cwt. more than the second lot. This amount of variation shows that it is an absolute impossibility to know exactly what a given quantity of bacon, etc., will

lose in weight in a given time, as the loss in the above case does not work out as one would naturally expect, the loss on the former being greater than the loss on the latter, whereas one would naturally expect the reverse to be the case. Therefore it is safer to calculate a little more than the average to be on the safe side. I will now try to deal with the carriage of goods before I turn to the scale of actual shrinkage. On every ton of bacon there is on an average 4 cwt. of wood, so the railway companies' charges ex Liverpool are (for the said ton of bacon) 24 cwt. at 25s. 10d. equals £1, 11s.; Liverpool cartage on same equals 3s. 6d. —total, £1, 14s. 6d., giving 1s. 9d. per cwt. for the bacon delivered to the door. Then, if you dry the said ton of bacon, it will shrink in weight to 17 cwt. 2 qrs. (*i.e.*, taking the average loss as 14 lbs. per cwt.), and that weight costing the aforesaid £1, 14s. 6d., makes 1s. 11¾d. per cwt. carriage on the bacon when in condition for sale. On lard in pails the railway companies' charges ex Liverpool are very similar. For 80 pails (containing one ton of lard) they charge 25 cwt. at 25s. 10d. per ton, with 3s. cartage, making a total of 35s. 4d., or 1s. 9d. per cwt. on the nett weight of lard. On lard in kiels it is a little less, coming out at 1s. 8½d. per cwt. on the nett weight of lard.

Cheese.—Ex Liverpool, costs 1s. 6¾d. per cwt. nett, per railway company; ex Liverpool, costs 1s. 5d. per cwt. nett, per canal company; ex London costs 1s. per cwt. nett, per railway company; ex London, costs 11d. per cwt. nett, per canal company.

Salmon.—Ex Liverpool, costs 11d. per case per railway company; ex London, costs 7d. per case per railway company; ex London, costs 6½d. per case per canal company. N.B.—All the above are taken from the companies' accounts.

Eggs.—There are too many ports with their different rates to give the charges in a paper like this. But it is advisable to allow a liberal estimate for the broken ones, for it is common knowledge to everyone that the difficulties which exist in obtaining redress from the railway companies on such claims (although we pay excessive rates for the conveyance of the goods). This fact not infrequently leads the trader to pass the matter over entirely. N.B.—Not the excessive rates, but the difficulties.

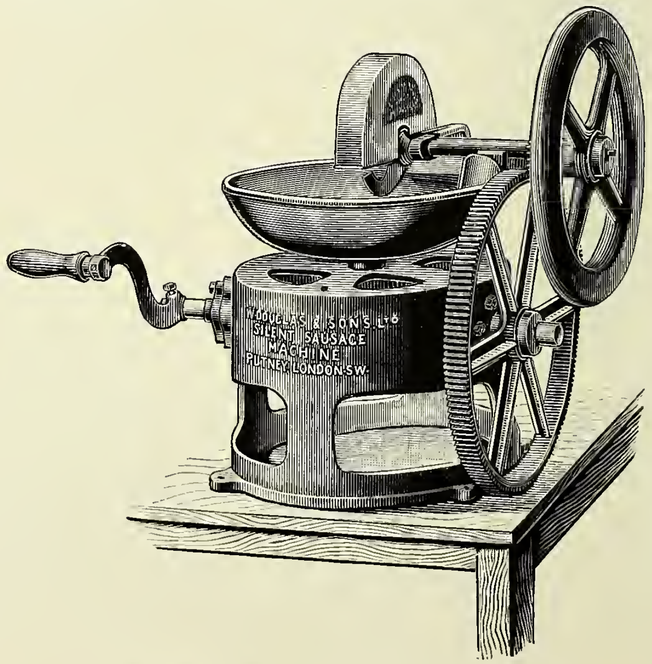
Before passing on I should like to refer to the Liverpool cartage charges, which, in my opinion, are a great inconvenience to trade, as it is difficult to check with any degree of accuracy the amount charged, or to ascertain whether the railway companies have charged the cartage as well as the house for the consignment. A case in point came to my knowledge a few weeks ago. A trader in this town being charged 6s. 8d. by the railway company and 4s. by the house for cartage on the same consignment of eight boxes of hams. I believe the rate ex London is in part comprised of 3s. 6d. per ton for cartage in London, and I contend that it would be far better for the railway company in Liverpool to do the cartage and include it in their rate, seeing that there are a great many more stations and receiving depôts in Liverpool than there were a few years ago, and the distance the goods are now carted is considerably less than formerly. Therefore I should say if 1s. 8d. per ton were added to the rate it would compensate the railway company well, and do away with the present anomaly and friction.

Then there is the question of weight. The large amount of short weight we get (or rather that we lose), and it is only safe to reckon something on the cost to meet this contingency, for unless the box of bacon is turned out the day it is received, and a claim immediately preferred, the claim is very politely refused, and it is not always convenient to unpack bacon at a moment's notice; and, on the other hand, it is not fair to expect a firm to allow for short weight some days or weeks after the goods have been delivered, for a box of bellies, etc., will lose from 4 to 6 lbs., and a box of hams, etc., will lose from 6 to 9 lbs. in a week if stored in the warehouse, *i.e.*, if it is left to remain in the box and not hung up.

Now with regard to the question of calculating the cost of drying bacon:—Take 1 cwt., costing 28s. per cwt., and say it loses 14 lbs. The correct way to calculate the amount of that loss, is not to say 14 lbs. at 28s. equals 3s. 6d., and then add the 3s. 6d. to the 28s., thus making 31s. 6d. per cwt. But ascertain at what per cwt. it takes to make 28s. of the 98 lbs. It is apparent to everyone that if we only get 98 lbs. out of a cwt., we must make the total for the 98 lbs. equal the cost of the 112 lbs., to recoup the original outlay. (98 lbs. at 32s. comes to 28s.)

I have purposely refrained from referring to the cutting up of bacon, as my purpose is not so much to deal with that as the question of preparing for sale. Therefore I will proceed to give you some actual weights that have been taken expressly for this purpose, no artificial heat being used in the drying of same. I may further add that the figures correspond to a nicety with the previous scale I have in my possession (see next page).

Silent Meat Cutters.—Of meat cutters there are many varieties. Almost every country has its own speciality, and the force of usage and custom makes it difficult to convince makers of sausages and small goods that anything but the machine they know can be of any service to them. Of late



Silent Meat Cutter for fixing to a Table or Bench.

years the business of sausage making has taken immense strides, not only in the United Kingdom but all over Europe. In the United Kingdom some hundreds of

TABLE OF SHRINKAGE.

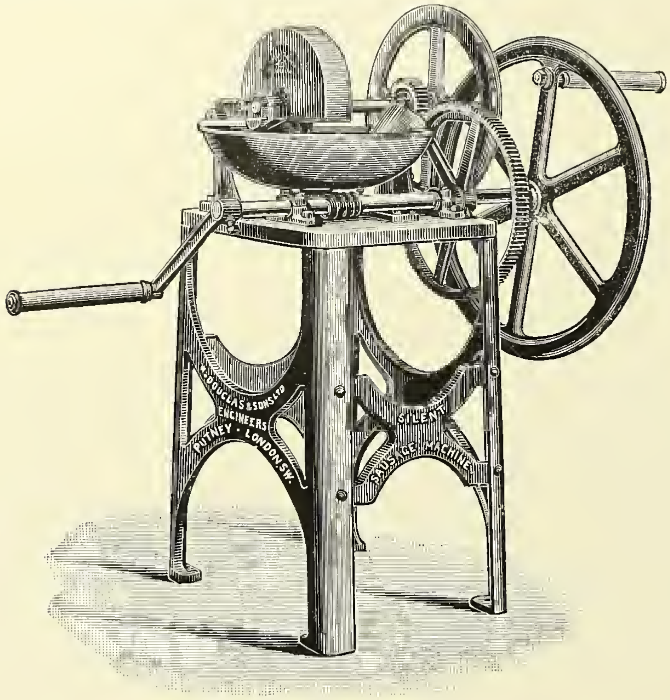
Un-packed.	lbs.	oz.		lbs.	oz.		Per cwt.	Total. £	s.	D.	Loss per cwt.
8 Hams, average 15¼ lbs.											
March 18	121	12				Say cost home	50/0	2	14	4½	
,, 25	114	10	Loss in 7 days	7	2	Making cost	53/3	2	14	5	3/3
April 1	111	12	,, 14 ,,	10	0	,,	54/6	2	14	4½	4/6
,, 15	107	14	,, 28 ,,	13	14	,,	56/6	2	14	5½	6/6
,, 22	105	14	,, 35 ,,	15	14	,,	57/6	2	14	5	7/6
,, 29	104	3	,, 42 ,,	17	9	,,	58/6	2	14	4½	8/6
10 Hams, average 11¼ lbs.											
March 18	112	2				Say cost home	51/0	2	11	0½	
,, 25	103	12	Loss in 7 days	8	6	Making cost	55/1½	2	11	1	4/1½
April 1	100	11	,, 14 ,,	11	7	,,	56/10½	2	11	0½	5/10½
,, 15	96	12	,, 28 ,,	15	6	,,	59/1½	2	11	0½	8/1½
,, 22	95	9	,, 35 ,,	16	9	,,	59/9	2	10	11	8/9
,, 29	93	3	,, 42 ,,	18	15	,,	61/3	2	11	0½	10/3
12 Hams, average 9½ lbs.											
March 18	114	3				Say cost home	53/0	2	14	0½	
,, 25	106	5	Loss in 7 days	7	14	Making cost	57/0	2	14	1	4/0
April 1	102	4	,, 14 ,,	11	15	,,	59/3	2	14	1	6/3
,, 15	97	12	,, 28 ,,	16	7	,,	62/0	2	14	1	9/0
,, 22	95	9	,, 35 ,,	18	10	,,	63/4½	2	14	0½	10/4½
,, 29	93	12	,, 42 ,,	20	7	,,	64/6	2	14	0½	11/6
8 Drafts (bellies) average 14 lbs.											
March 18	112	12				Say cost home	50/0	2	10	4	
,, 25	103	9	Loss in 7 days	9	3	Making cost	54/4½	2	10	4	4/4½
April 1	100	8	,, 14 ,,	12	4	,,	56/0	2	10	3	6/0
,, 15	98	1	,, 28 ,,	14	13	,,	57/6	2	10	4	7/6
,, 22	97	0	,, 35 ,,	15	12	,,	58/0	2	10	3	8/0
10 Backs, average 11¾ lbs.											
March 18	117	0				Say cost home	44/0	2	5	11½	
,, 25	108	4	Loss in 7 days	8	12	Making cost	47/6	2	5	11	3/6
April 1	104	13	,, 14 ,,	12	3	,,	49/1½	2	5	11½	5/1½
,, 15	101	12	,, 28 ,,	15	4	,,	50/9	2	5	11	6/9
,, 22	100	2	,, 35 ,,	16	14	,,	51/6	2	5	11½	7/6
16 Picnics, average 7 lbs.											
March 18	113	10				Say cost home	39/0	1	19	7	
,, 25	103	14	Loss in 7 days	9	12	Making cost	42/9	1	19	7½	3/9
April 1	98	11	,, 14 ,,	14	15	,,	45/0	1	19	8	6/0
,, 15	92	14	,, 28 ,,	20	12	,,	47/9	1	19	7	8/9
,, 22	90	1	,, 35 ,,	23	9	,,	49/3	1	19	7	10/3
10 N.Y. Shoulders, average 11¼ lbs.											
March 23	113	2				Say cost home	39/6	1	19	11	
,, 30	103	6	Loss in 7 days	9	12	Making cost	43/3	1	19	11	3/9
April 6	99	5	,, 14 ,,	13	13	,,	45/0	1	19	10½	5/6
,, 13	97	4	,, 21 ,,	15	14	,,	46/0	1	19	11	6/6
,, 20	94	10	,, 28 ,,	18	8	,,	47/3	1	19	11	7/9
3 Staff. Middles, average 37¾ lbs.											
March 23	113	0				Say cost home	46/0	2	6	11	
,, 30	105	12	Loss in 7 days	7	4	Making cost	49/7½	2	6	10½	3/7½
April 6	103	2	,, 14 ,,	9	14	,,	51/3	2	6	11½	5/3
,, 13	102	4	,, 21 ,,	10	12	,,	51/6	2	6	11	5/6
,, 20	100	8	,, 28 ,,	12	8	,,	52/3	2	6	11	6/3
,, 27	99	3	,, 35 ,,	13	13	,,	53/0	2	6	11	7/0

What is known as "German Sausage" sometimes loses as much as 6 lbs. to the cwt. in eight days.

	cwts.	qrs.	lbs.
A hundred September Cheese weighed November 28	73	0	13
,, ,, ,, ,, January 25	72	1	3
Actual loss	0	3	10

Showing a loss of 94 lbs., or an average loss of over 1¼ lb. per cwt. Earlier made Cheese will lose considerably more, June make losing 1 lb. per cwt. in three weeks. Goods that have been in cold storage shrink like butter in the sun.

factories now exist, some of these professing to be the "largest in the world." A statement of that kind, however, like all exaggerations, is hardly likely to be of much service



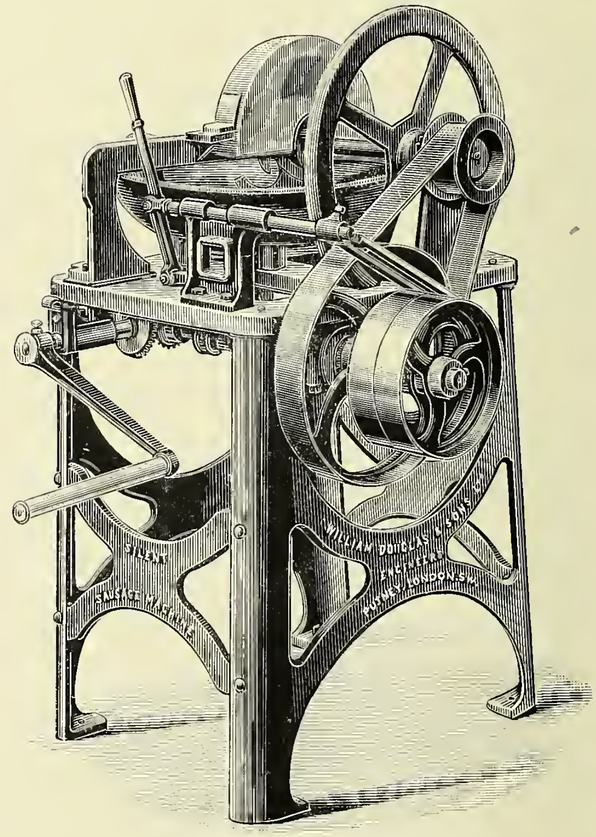
Silent Meat Cutter for Hand Power.

to anyone, inasmuch as it is not one which can be contested even if it were thought worth while. So far as England is concerned, it shows a lamentable ignorance of what is done in other countries. We are, however, an insular race, and ignorance of our neighbour's affairs is the special privilege in which we glory. The United Kingdom is only beginning, as it were, to be a sausage eating country, and is developing rapidly. Perhaps in years to come it may rival Germany, but that is hardly likely.

"Silent" machines, so-called, are of French origin, and the designs were not known in this country till after 1851. Why the name "silent" should have been applied to them is obvious enough considering that they gradually displaced the vertical chopper. The noise made by the latter as compared with the "Silent" was unbearable, and in towns their use became hardly possible. The "silent" machine deserves the name, therefore, in comparison with the vertical machine, but it is only a comparison as total silence in working them is not obtained. The only machines which approach silence in working, are those bearing the name of the "Alexander," hence their universal adoption in hospitals and other places.

The "Silent" machine consists of a dished bowl mounted on a vertical shaft; over this bowl is fixed a horizontal shaft between the centre and the circumference of the bowl, and on this shaft are fixed curved knives which, on rotation, follow within a thirty-second of the surface of the bowl. The knives pass through a kind of comb which cleans off the meat. The bowl itself is rotated by worm gearing fixed on the shaft so that the sausage meat is carried round under the knives. Appliances are usually fixed at the edge of the bowl to turn over the meat, and the machine not only cuts the meat thoroughly but mixes it as well. The knives, of course, are made adjustable so that wear can be allowed for: the speed the knives are driven at is usually from 600 to 800 revolutions per minute. Sausage meat can be cut rough or into a very fine paste according to the length of time it is kept in the machine.

These machines have the great advantage of cutting meat very rapidly, but, of course, the more rapidly the meat is cut the more quickly it will heat, and it is obvious that if heated meat is put into sausage skins it will speedily become putrid. Much of the bad odour in which sausages are held in summer time is due to this cause, and the improper understanding of what the correct temperatures should be. In order to keep the temperature down it is best to use an "Alexander" machine for cutting the meat roughly first, after that put it into the "silent" machine. The resulting meat will be better cut and will not be heated.



Silent Meat Cutter for Power.

The silent machine is made in many sizes, some of which are driven by hand, others by power communicated by a belt and pulley, while a few are driven by a steam engine forming part of the machine. The bowl usually consists of cast iron turned true and polished bright, but of late years some makers have introduced enamelled bowls, which have met with a degree of acceptance.

Singeing Furnaces.—see Pig Singeing.

Skeleton of the Pig.—

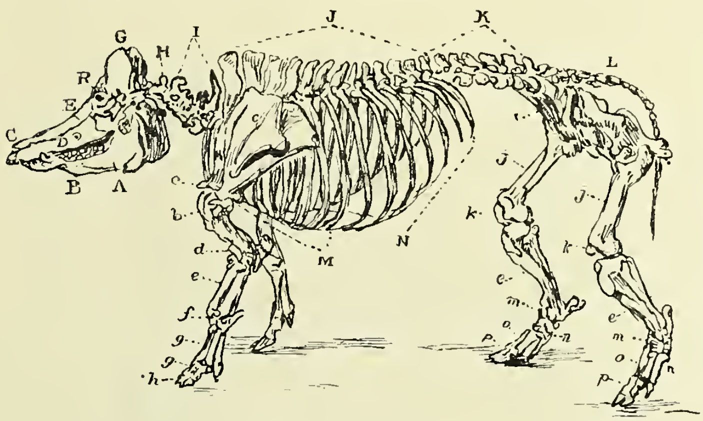
The Head.

A Maxilla inferior, vel posterior—lower jaw.
B Dentes—the teeth.
C Ossa nasi—the nasal bones.
D Maxilla superior, vel anterior—upper jaw.

E Os frontis—the frontal bone.
F Orbiculos—the orbit or socket of the eye.
G Os occipitis—the occipital bone.

The Trunk.

H Atlas—the first vertebra of the neck.
I Vertebrae colli, vel cervicales—the vertebrae of the neck.
J Vertebrae dorsi, vel dorsales—the vertebrae of the back.
K Vertebrae lumborum, vel lumbales—the vertebrae of the loins.
L Ossa coccygis—the bones of the tail.



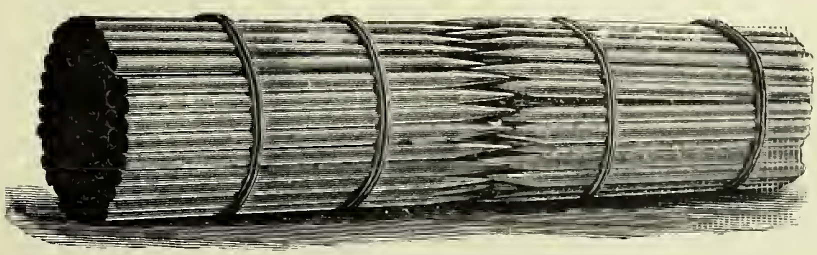
Skeleton of the Pig.

Fore Extremity.

a Scapula—the shoulder blade.
b Humerus—the round shoulder bone.
c Sternum—the breast bone.
d Ulna—the elbow.
e Radius—the bone of the fore-arm.
f Os naviculare—the navicular bone.
g g Phalanges vel ossa pedis—the first and second bones of the foot.
h Phalanges, vel ossa pedis—the bones of the hoof.

Hind Extremities.

i i Pelvis (ossa innominata)—the haunch bones.
j j Os femoris—the thigh bones.
k k Patella—the stifle bone.
l l Tibia—the upper bone of the leg.
m m Tarsus—(one of which is the *N*—os calcis) the hock bones.
n n Os naviculare—the navicular bone.
o o Digiti, vel phalanges (ossa pedis)—the first digits of the foot.
p p Digiti, vel phalanges (ossa pedis)—the second digits of the foot.



Double Bundle of Skewers.

Skewers.—Are manufactured from steel, iron, or wood, and are usually made in great variety. The wood skewer trade up to comparatively recent times was always looked upon as a perquisite of the gipsies, but the article produced was generally of a rough, unfinished type. Improved machinery has practically superseded making by hand, and the gipsy skewer is now not much more than a name. The common types of skewers are those made from hickory and maple, and a description of same will be found under the headings of Hickory Skewers and Maple Skewers.

Skimmer.—see Lard Renderers' Tools, also Cooks' Utensils.

Skins (Cleaning).—see Casings.

Skins (to Pickle for Sausages).—Run them out in a tub of water when reeded, but keep them as long as you can in lengths. Make brine out of dirty salt (to carry a pig's foot), and then bring it down fifty per cent. by adding cold water. Let them remain four days in pickle, and if the skins rise sooner than that, put cold water in so as to weaken the brine. Then take them out into cold water, and let them remain four or five days according to the weather. They need more water in summer than in winter, but they must be stirred up with a stick three or four times a day. Then put them in a tub of water containing two buckets of cold water and one of hot at 110°. Follow on till ready for scraping, then scrape them, and after that put them in a strong brine for a day. Take them out on a wicker to drain them, and rub clean dry salt into them, and put up in bundles of about one lb., but keep them from the air as much as possible.

Skirting.—The diaphragm separating the thorax and abdomen in bacon pigs.

Slaughter-House Fittings.—see Abattoirs.

Slaughter-Houses.—see Abattoirs.

Slaughter-House Weighing Machine.—see Weighing Machines.

Slicing Machine for Fat.—see Fat Cutter for Cutting Thin Slices of Fat.

Smithfield Club.—The benefits conferred on stock breeders and meat purveyors by the Smithfield Club would be difficult to estimate so as to give the Club its true mead of praise. The annual show in the Agricultural Hall, London, is looked forward to, as a function that must be attended to, by breeders and purveyors alike. In recent years, however, the interest to purveyors has been very much enhanced by the adoption of the block test in the judging of cattle. This test is briefly:—The judging of the cattle when alive, and allowing so many points, and re-judging them again when slaughtered, and allowing so many points for the best carcase from a butcher's point of view. In former days the judging was altogether from a breeder's point of view, and, consequently, went in the direction of encouraging fat unsaleable animals, instead of studying the different points which enter into the composition of prime beef, from a butcher's point of view. Undoubtedly, the over-fat animal is a failure

from the latter standpoint, and judges are becoming more and more convinced that they must encourage the butcher's type of animal more than the breeder's ideal.

The history of the Smithfield Club goes back more than a century, for, in 1798, the "Smithfield Cattle and Sheep Society" was founded by Mr J. Wilkes of Mearsham, Derbyshire, and several other well-known agriculturists. The then Duke of Bedford occupied the chair, and it is interesting to recall the names of at least a few of the gentlemen who attended the first meeting during the Smithfield Christmas Show in December 1798:—Lord Somerville, John Bennet, The Earl of Winchelsea, John Westcar, Richard Astley, John Ellman, Arthur Young, and about a score of others. The Club was duly formed, and, in course of the afternoon of 17th December, Sir John Banks and some others joined the Society. There was no specially defined objects to begin with, and all that was done was to offer premiums for the best cattle and sheep, fed in certain ways and of certain weights. Two years after the formation of the Society, the Duke of Bedford proposed that a regular Club should be formed, and this was carried out. At first the membership was limited to fifty, but subsequently restriction as to numbers was abolished. It was in 1802 that the title "The Smithfield Club" was adopted.

The Club has had many ups and downs, but possibly the lowest ebb in its affairs was after the war with France, when agriculturists were so severely hit, and in the year 1817 no prizes were offered.

The block test, mentioned already as having been recently adopted, was, at the earlier shows, always carried out. The judges selecting two of the best animals in each class to be first of all exhibited, then slaughtered, and points given for weight (distinguishing the fore-quarters from the hind-quarters), tallow, hide, pelt, offal, blood, etc. This system, however, was abandoned for that of judging the live animal only. It was in 1862 that the Club removed their Show to the Agricultural Hall, Islington, and it has been held there annually ever since.

Smoke Compound.—A thick liquid which gives both the colour and the flavour of smoke to hams and other goods. It may either be put into the copper in which the goods are boiled (which is the correct style for sausages, etc.) or painted on hams with a brush. When the latter method is adopted it should be painted on very lightly, and as each application dries, a fresh coat should be painted on for two or three applications. Where convenient, it is always better to finish off the goods by hanging for a short time in the smoke oven, although this is not essential.

Smoked Beef.—see Beef (smoked).

Smoked Ham.—(*German Recipe*).—Cut the two fore legs from a pig from the neck bone to the first joint of the leg, back to the fifth rib, so that the whole back fillet comes in with the leg. Remove the bones, and lay the two hams for six days in a salt pickle. Then take them out, wash them, lay the two pieces tightly against each other, and roll them up. Now wind thin string round about the roll, leaving each round of string half an inch from the last. The whole length of the ham should be about 15 inches. Let them hang outside for several days to dry, and then smoke them gently from six to eight hours with juniper-berries until they are of a light-brown colour.

Smoke Flavouring Powder.—A powder used for imparting a smoky flavour to sausages, etc., such as is produced by smoking with oak or other hardwood sawdust. The process of smoking resolves itself into the eliminating by combustion of the fine particles of tarry matter present in the wood; it is therefore reasonable to suppose that if by chemical processes this matter can be collected as a distinct article, the same flavour can be imparted without the trouble and loss of smoking. The heat produced during smoking very often acts injuriously on hams and sausages unless very carefully regulated; but even with regulation a certain loss is sure to take place, which by the use of smoke powder can be avoided. The conventional colour of the smoking can easily be given to the skin by the use of dyes such as "Smoke Dye," etc. Smoke powder should be used at the rate of 1 oz. to 10 lbs. sausage material.

Smoked Pork Sausage.—see Pork Sausage

Smoked Sausage.—

16 lbs. pork.
5 ,, fat.
7 ,, bread.
3 ,, sausage meal.
2 ozs. dry antiseptic.
9 ,, salt.
3 ,, pepper.
½ ,, grated nutmeg.
1 ,, saltpetre.
1 teaspoonful smoke powder.

After cooking, smoke lightly in smoke hole.

Smoked Sausage or Knackwurst.—Take 60 lbs. of raw lean cut from the fore-quarters of a hog, 14 lbs. of raw beef, 26 lbs. of raw fat pork. Chop until made very fine, then add 16 oz. salt, 5½ oz. ground pepper, 1½ oz. saltpetre, 2½ oz. caraway seeds (whole); a small amount of finely chopped garlic may be added if desired. Stuff in beef rounds or hog casings. Should be hung in an open place from 4 to 8 days, and when well dried smoke for 6 days. They may then be preserved in a cool dry place.

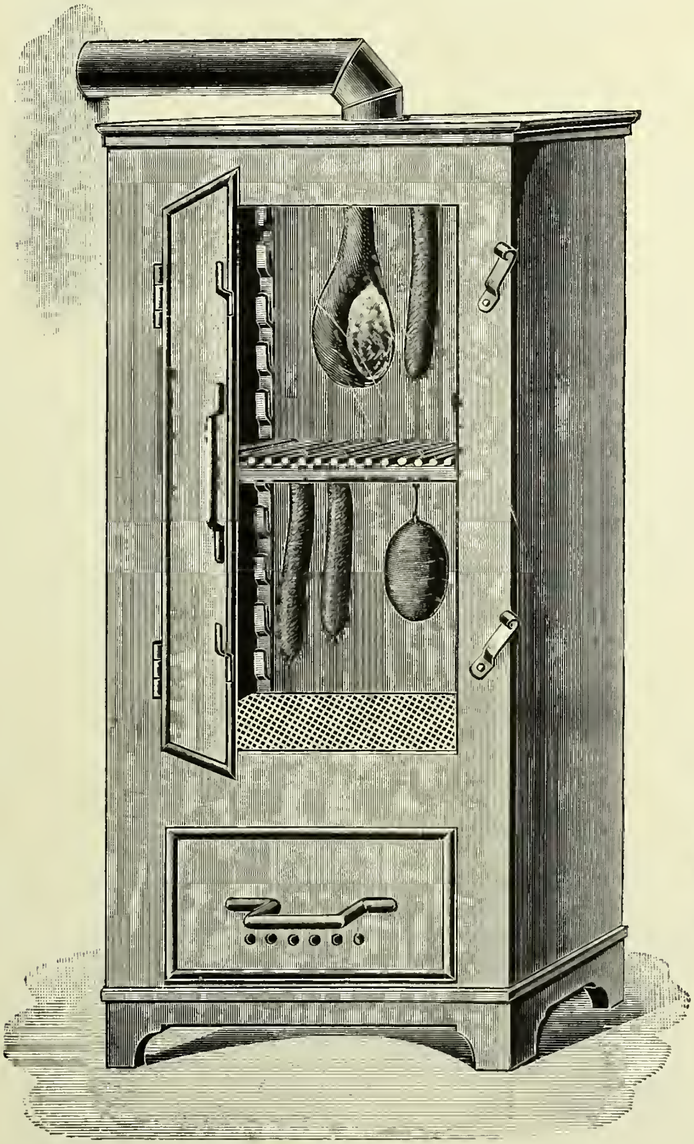
Smokeless Hams.—see Hams.

Smoke Oven (German style).—In Germany the smoke oven is used for many other purposes besides smoking sausages, and the description of one design much in use is as follows:—

The best course in dealing with meat or fish, which it is desired to smoke or cure, is—after drying it well in the air—to place it in the smoking chamber. When the oven is thus charged, the hinged door or trap is opened and the fire-box removed. The bottom of such fire-box is then littered with wood shavings, and the clear space above these is filled up with sawdust. The wood shavings serve to keep the sawdust loose, or prevent it from settling into a concrete mass, this being the main condition upon which an even and satisfactory combustion of the whole of the mixed fuel depends. The heat may be controlled or regulated by means of the sliding lid or damper, with which the fire-box is fitted for the purpose. In smoking herring, the large sliding lid should be removed from the fire-box. The

same applies to hot sausage meat. Besides, in the case of the last-mentioned commodity, it is advisable to heat the stove with hardwood. In smoking meat, however, the large lid should be replaced upon the fire-box, and the smaller slide or damper alone opened.

When it is desired to inspect the goods in process of being smoked the flue is closed, and the damper of the main door opened. The chamber will then rapidly clear of smoke, and the provisions may be examined without inconvenience; whereupon the damper just mentioned is closed again, the flue damper re-opened, and the stove or oven allowed to resume its operations as before. At the top of the stove pipe, which should, of course, be connected with the

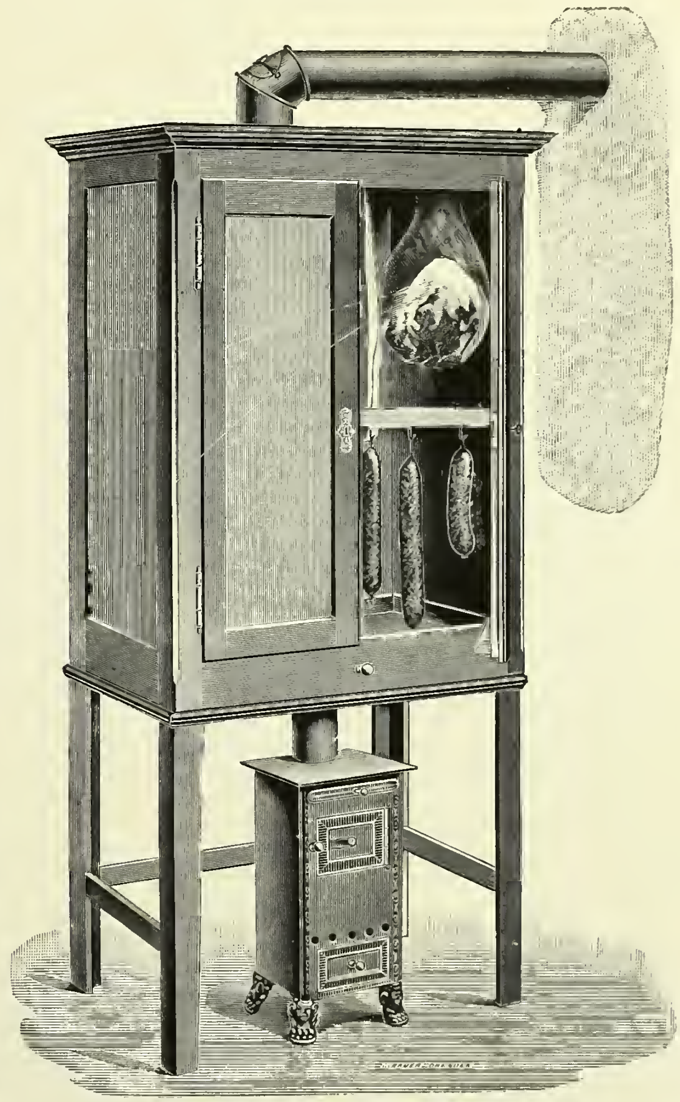


Smoke Oven.

chimney by means of an additional length of pipe, there is arranged a hinged damper or door, which is adjustable according to the requirements of the draught to be created through the chimney.

Smoke stoves may be made of many designs. The above illustration shows one which is extensively adopted. Another is made with the stove separate, and this is a very convenient form.

Smoke Stoves.—In sausage factories it is necessary to have an iron smoke stove for such goods as smoked saveloys, Frankfort sausage, Vienna sausage, and others of a similar character. Small manufacturers can also use such a stove for *all* their work, namely, the smoking of hams and bacon, German sausages, and all other goods.

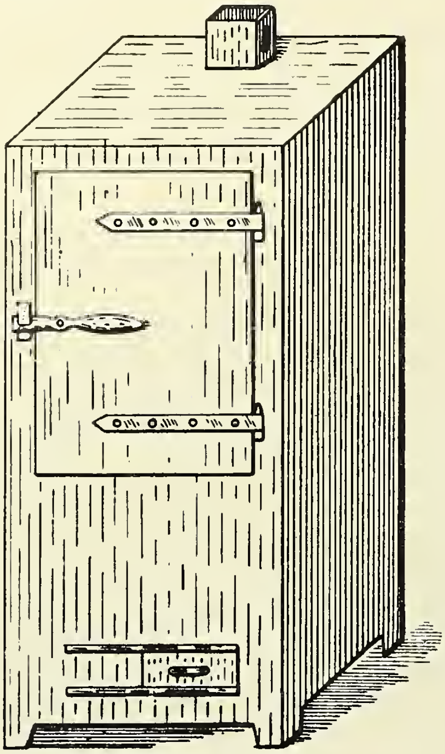


Smoke Oven, with separate Stove.

The great advantage in having an iron stove seems to lie in the fact arrived at by experience, that a finer "gloss" or "bloom" is put on to the sausages especially, than would be the case if they were smoked in a built stove. Whether this is so or not is quite immaterial, as the advantage of a small stove to many people is very great. The temperature to be aimed at is 85° Fahr., and this temperature will be found the correct one for most things.

The material used for smoking is oak or any other hardware sawdust, together with some fine chips of the same wood. It is lit and allowed to smoulder away, the while it gives off the smoke which contains the pyroligneous acid necessary

for flavouring the goods. The heat ascends upwards, and effects the drying.



Portable Smoke Stove.
Made from ordinary thin iron sheets.

The sizes of the stoves generally made are :—

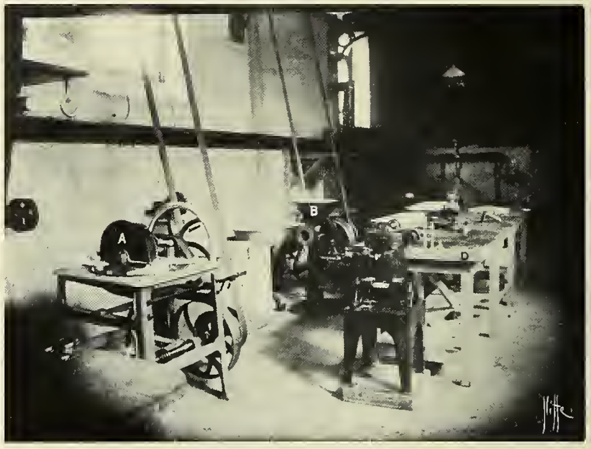
No. 1	...	6 ft. 0 in. × 2 ft. 6 in. × 2 ft. 6 in.
,, 2	...	6 ft. 4 in. × 3 ft. 0 in. × 3 ft. 0 in.
,, 3	...	6 ft. 8 in. × 3 ft. 3 in. × 3 ft. 3 in.
,, 4	...	7 ft. 0 in. × 3 ft. 6 in. × 3 ft. 6 in.
,, 5	..	7 ft. 6 in. × 3 ft. 9 in. × 3 ft. 9 in.
,, 6	...	8 ft. 0 in. × 4 ft. 0 in. × 4 ft. 0 in.

Smoking Temperature.—see Temperatures for Bacon Curers.

Soda Bicarbonate.—see Bicarbonate of Soda.

Soda Crystals.—see Washing Soda.

Somersetshire Bacon Factory.—*New Bacon Factory at Bruton, Somerset* (written October 1899). — The source from which many of the pigs cured and sold as "Wiltshire" are obtained is Somersetshire. That county is one of the most celebrated in England for its dairy industry and its cheese factories. No wonder, then, that pig growing flourishes there. The pigs of the county are much in demand by the curers in the West of England, and reach the buyer of bacon under the traditional title "Wiltshire bacon." Why Wiltshire should be celebrated for bacon it is difficult to see, as a glance at the agricultural returns shows that it is one of the very smallest pig-producing counties. Possibly it was there that the modern system of mild curing took its origin. Whether that be so or not, it is a fact that mild-cured bacon may be cured by anyone who



Sausage Making Room.

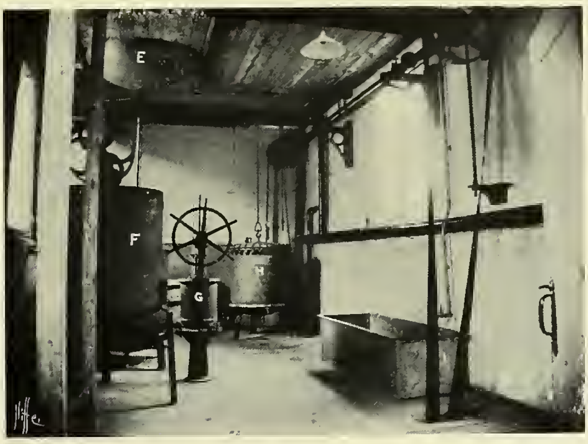
A Silent sausage machine.
B Fat and lard cutter.
C Vertical sausage filler.
D Work table.

likes to put himself to the trouble to learn a few simple facts, and who will equip a proper place for curing.

In the West of England there is more English bacon cured than in any other part, the city of Bristol being, as it were, the hub of the bacon curing area. But the total produce of England as compared with the imports is very trivial. Thus, we find that during 1899 there was imported into England from Denmark, the United States, Canada, and some other countries, the enormous value in bacon and hams of £14,495,102 sterling. Why some of this produce

General View of Factory.

cannot be made at home many would like to know. Probably it is want of education in pig breeding, or it may be the want of proper markets for pigs. Denmark alone, a small country which in a quarter of a century has con-



Lard Room with various machines and appliances.

E Dish bottom of lard rendering tank projecting through ceiling.
F Douglas lard agitator.
G Cold lard bladder filling machine.
H Douglas bone digestor.
I Bladder floating tank.

verted itself from a non-bacon producing country to one of the most important, sent us last year £2,945,757 worth of bacon.

Here in England we have the separated milk from our dairies, we have the best breeds of pigs, as is proved by the fact that our pedigree pig-growers ship animals to all parts of the world, and we have our factories in which to make the bacon. And yet the imports of bacon from other countries continue to increase. Our factories are in every way equal

Douglas Pig Singeing Stack, Scuttling Table, and Scalding Tank.

J Singeing stack.
K Scalding tank with cradle.
L Scuttling table.

to those of other countries, and, as an example, we can have no better than that of the Somersetshire Bacon Curing Company at Bruton, Somerset. This place has just been opened and started on its career with every prospect of a prosperous future. The factory is situated at the little market town of Bruton, in the county of Somerset, and was instituted by some prominent residents in the vicinity. For six months the workmen have been busy converting the premises (an old mill) into their present shape, and now the finished article looks very handsome indeed.

One of the advantages is a large supply of water power, and this the engineers have brought into use by putting down twin turbines so as to serve as an auxiliary power. This feature is so unique in bacon factories in the United Kingdom that it may be said to be the only factory where water power is in such use.

The general departments of the factory from the gate inwards are: (1) Dwelling house. (2) On the right a three-storey building containing, on the basement floor, portion of cellarage and air-cooler; on ground floor, lard room; on first floor, sausage, pie-making, and lard-melting rooms; on

Hanging House.

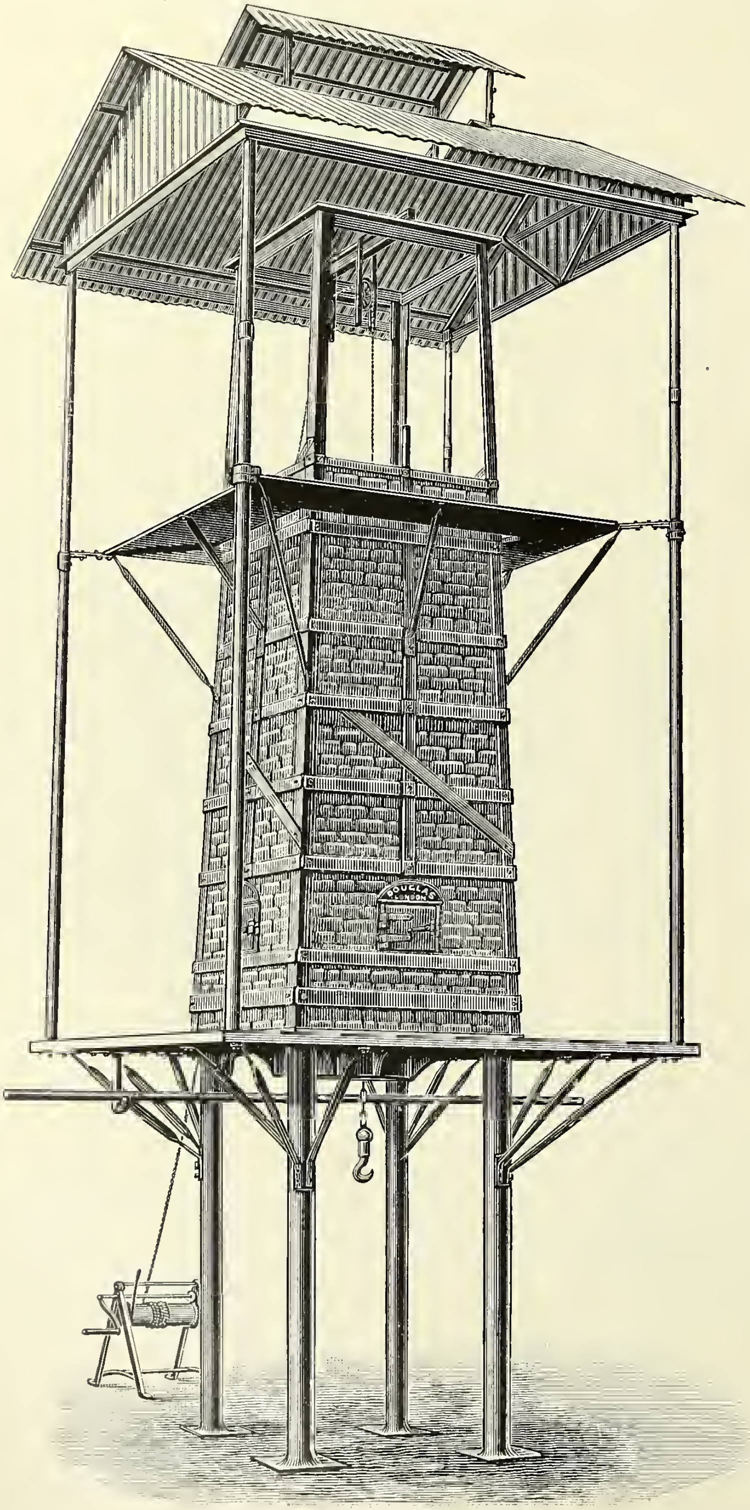
P Hanging bars for pigs, with specially designed switches.
Q Douglas pig weighing scale forming section of hanging bars.
R Sides of pigs hanging on bars.

second flour, general store room. Portion of the basement also contains boiler and engine-houses. The cellars extend under ground under the yard, as does also the chill room. Right in front is the hanging house, with a hanging capacity for five hundred pigs. Further on to the left is the slaughtering tack, and behind are the pig-styes and a large field, the property of the company.

The factory is designed to deal with three to five hundred pigs per week to start with, but can easily be extended to deal with that number per day.

The boiler-house contains a large high-pressure boiler with ample spare power, and the engine-room contains a twenty-five horse-power horizontal steam engine. These are the main sources of heat and motion, and their ramifications extend throughout the whole factory. The refrigerating machinery is very complete, and the machine itself is o the patent carbonic anhydride refrigerating type. It is of the horizontal land type, and if it were applied to ice-making would produce four tons of ice per day, this being equivalent to eight tons of ice melted. Attached to the

refrigerating machine is an air-cooler of special design. It is worked on the dry air principle, so that air circulated over its coils (which contain cold brine pumped through con-



The Douglas Improved Singeing Stack.

stantly from the evaporator of the machine) is distributed through the chill rooms and cellars in a perfectly dry state. The air in these places is passed over the coils, and any moisture contained in it is extracted and deposited on the pipes, thawing off when the machine is stopped, and being run away as water through a trap from a lead saucer in the bottom of the cooler. This air-cooler is sufficient to produce the necessary coldness required in the chill rooms and cellars, but, in the opinion of the engineers, while dry air circulation may be the best and only perfect condition for chill rooms, it is not so with cellars, in which very little circulation is necessary. There has, therefore, been provided a duplicate set of cooling arrangements in the shape of brine drums, in which large quantities of chilled brine are stored up, and continue the cooling long after the machinery has been stopped. Nothing has been spared in the chill rooms and cellars to make them perfect.

Souse.—Scrape and well clean the pig's feet and ears, put in cold water, place over the fire and boil. When tender, put them in a jar, covering with a pickle of cider vinegar in which whole black pepper, mace, and cloves have been boiled. Then pour the liquor over the meat in the jar. Let it stand for two or three days, when it will then be ready for use. Keep the meat below the brine by means of a weight.

South Australia.—The preliminary live stock statistics for 1899-1900 give the numbers of the various classes in different divisions of the Colony as follows:—

Horses	168,695
Milch cows	83,527
Other horned cattle	192,267
Sheep, including lambs	5,667,283
Goats	7,399
Pigs	82,901

In every case these totals show considerable increases over the previous year.

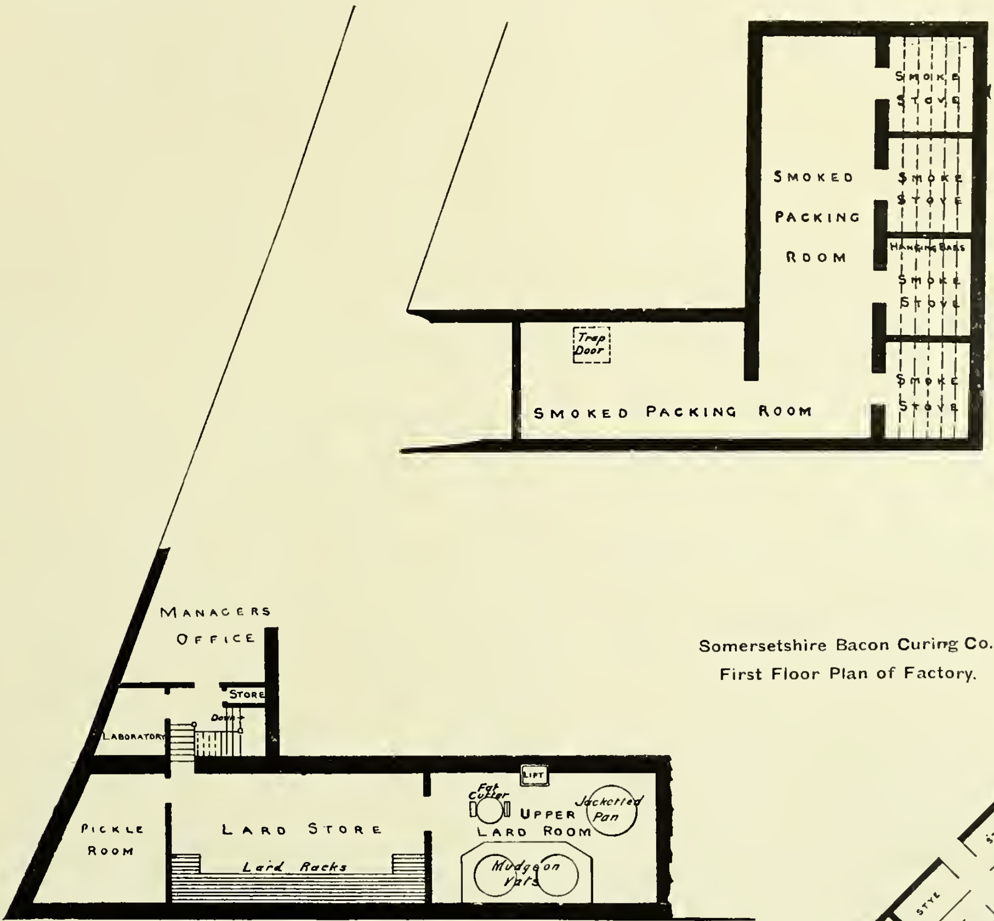
The number of poultry of all kinds is 1,122,812. The quantity of butter made being 5,581,231 lbs.; while cheese made, totals 946,930 lbs.—in both cases being large increases on the previous year.

Among the general exports of the Colony for 1899 the following totals are found:—

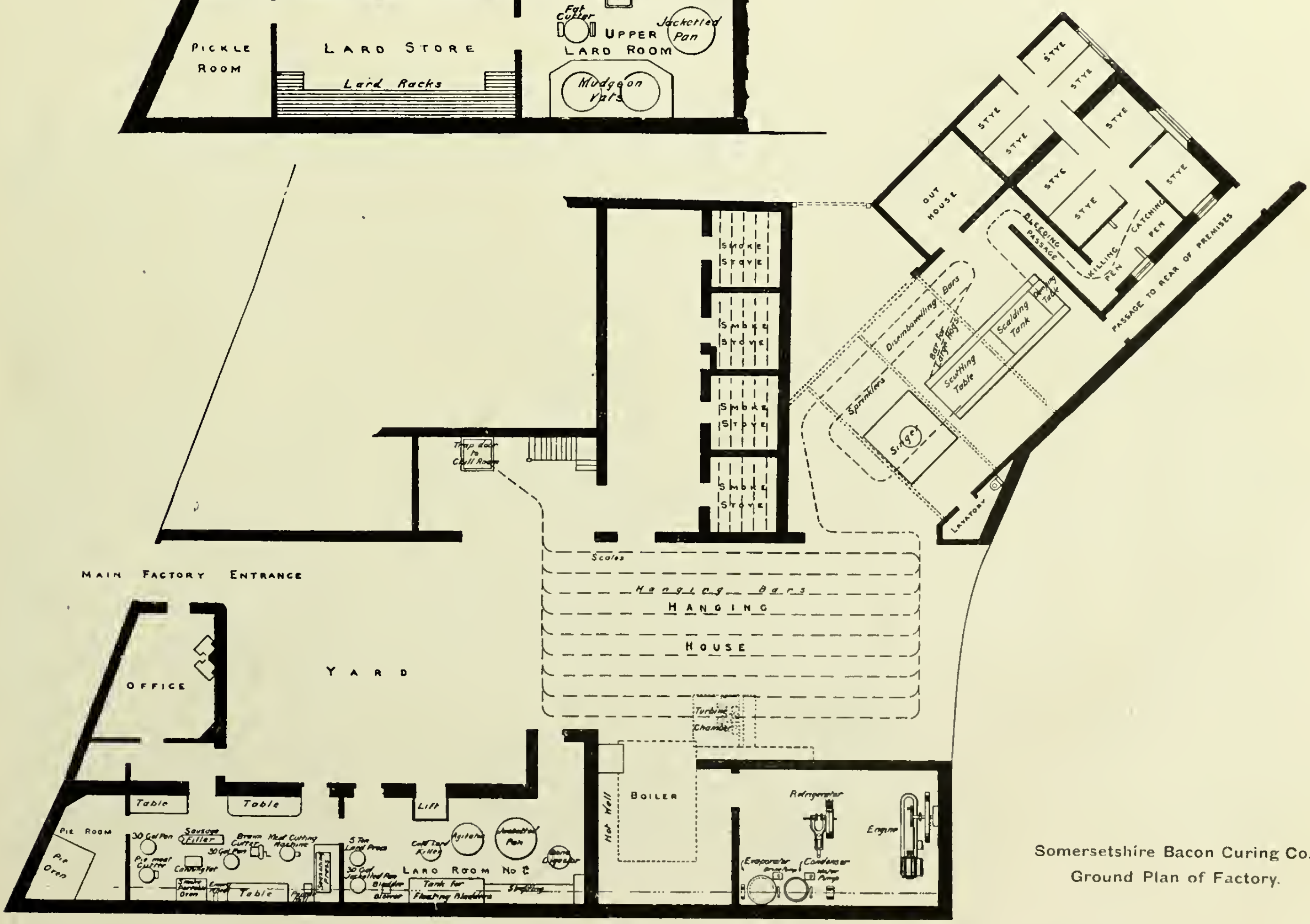
Bacon and hams	416,155	lbs. valued at	£12,162
Butter	1,867,157	„ „	81,083
Cheese	150,032	„ „	3,577
Eggs	......	„	62,493
Fresh meat	48,700	„ „	748
Beef in pickle	33,232	„ „	366
Frozen mutton & lamb	2,616,567	„ „	36,848
Preserved provisions	1,298,723	„ „	19,836
Preserved milk	463,784	„ „	8,760
Wool	48,146,812	„ „	1,889,905

The following importations were made during 1899, which in a measure neutralises the effects of the exports:—

Bacon and hams	273,705	lbs. valued at	£8,063
Cheese	128,574	„ „	2,995
Preserved provisions	167,871	„ „	6,072
Preserved milk	857,423	„ „	15,693
Wool	13,098,714	„ „	393,443



Somersetshire Bacon Curing Co.
First Floor Plan of Factory.



Somersetshire Bacon Curing Co.
Ground Plan of Factory.

Spanish Sucking-Pig Sausage.—Take a sucking-pig, about eight weeks old, and remove all the bones and rind, and chop up all the meat pretty fine. Add to this an ox tongue, or several pigs' tongues, which have been skinned and cut into dice, also three or four well beaten eggs—salt, pepper, and mace to taste—some grated lemon rind, one or two tablespoonfuls of capers, some ginger, and a glass of good Madeira. Mix all these ingredients thoroughly, and, if the paste is too stiff, add a little water. Cut some large slices, about one-sixth of an inch thick, from the breast of a pig, and lay them all over the paste, then sew them together, making one large sausage. Roll the sausage in a clean cloth, fasten at both ends, and at the middle. Boil from one to two hours, according to size, boiling gently. Lay on a table to cool, letting the string and cloth remain for twenty-four hours.

Spearmint.—see Culinary Herbs.

Spegepolse or Danish Smoked Sausage.—see Bacon Curing in Denmark.

Spiced Beef.—Procure an oak pickling tub and a salinometer, with which to test the strength of pickle, also a small pickle pump.

Prepare a pickle from following recipé :—

55 lbs. salt.
5 „ saltpetre.
5 „ sugar.
5 „ dry antiseptic.

Make the bulk up to 20 gallons with water, boil and skim till clear. It should test 100° on Douglas's salinometer. When the pickle is ready, add to it a cotton bag, in which is placed one lb. bay leaves, one lb. juniper berries, and one lb. coriander seeds, or ½ lb. bag "Amaryl." Occasionally drag this bag through the pickle so that its contents get properly extracted.

Lay the beef to be pickled on a bench or board just over the pickling tub, and pump it in a good many places with the pickle. Drop the beef into the pickle, and keep it weighted down by means of a big clean stone. There is a perforated board supplied with each tub so as to cover the meat and keep it all under the pickle. Leave the meat in the pickle for from seven to ten days according to the size of the pieces of meat. When the meat is cured, either send it out as it is, or fasten it up neatly with skewers, previously dusting some Jamaica pepper all over the inside parts. If it is desired to roll the meat, first lay it out flat, and dust all over with a mixture of Jamaica pepper and ordinary black pepper. Then proceed to roll.

If the rolls, etc., have to be sent out cooked, cook them till soft in water at 180° F., and allow to cool. Then trim off any ragged pieces, and dust all over with some fine bread crumbs. The rolls, etc., are then ready to send out.

Spice Balls.—see Savoury Ducks.

Spiced Corn Beef.—Take 20 lbs. of corn beef, fat and lean mixed, boil until nearly cooked, then add two ounces of each of the following named spices :—allspice, coriander, pepper, and one ounce of cloves (spices must all be whole); boil for half-an-hour and then take out the meat, leaving the spices in the pot liquor, as the meat will be sufficiently flavoured.

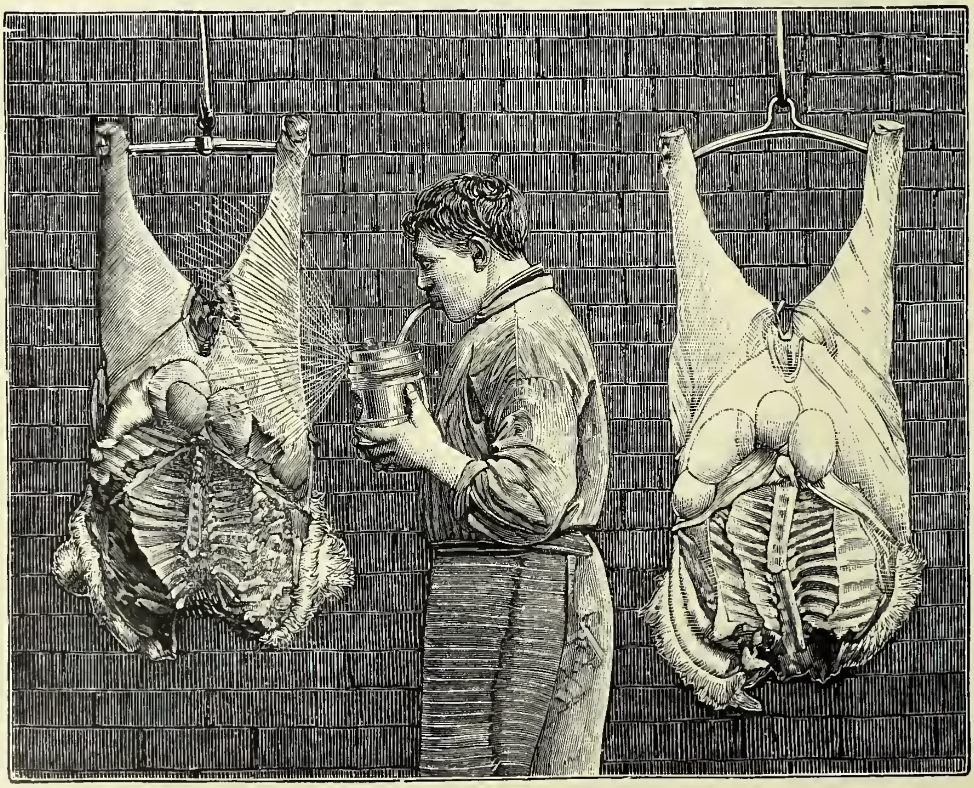
Spice Nuts.—see Savoury Ducks.

Spouting Apparatus.—An apparatus for spraying fat over meat, which does away with the objectionable, old-fashioned method of putting the fat into the mouth and spouting it. Spouting by the mouth was not only objectionable, but in the highest degree disagreeable and disgusting, not only to the operator but also to the consumer, who, in many cases, was compelled through the practice to swallow disease germs. This mechanical device is easily operated. The outside cylinder is filled with warm water, and the melted fat poured into the centre of the apparatus through a strainer. The operator then blows through the pipe, and a fine spray of fat falls evenly on the meat.

Spring Balance.—see Weighing Machines.

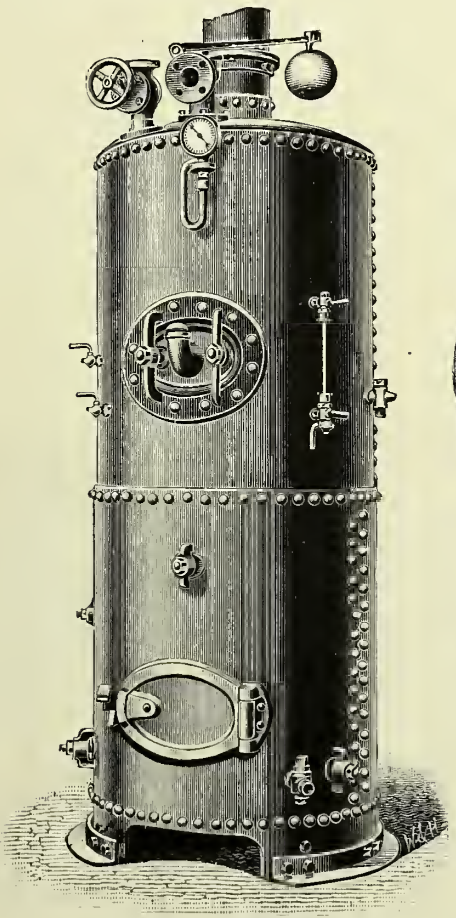
Sprinklers.—see Water Sprinklers.

Stand for Beef.—see Beef Stand.



Spouting Apparatus.

Steam Boilers.—In consequence of the great improvement in the tensile strength of boiler plates, and the substitution of steel for iron plates, the range of safe pressures has been greatly extended; and it is now quite common to work boilers at 100 lbs. pressure per square inch, and indeed much beyond this. These high pressures are of great advantage in connection with compound condensing engines, but they have also much increased the efficiency of the simple or one cylinder high-pressure engine. On the other hand, where cooking has to be done, it is better to have low-pressure steam, as the high-pressure steam is too hot; and the cooking apparatus, especially steam-jacketed pans and such-like apparatus, are not constructed as a rule to stand very high pressures. The pressure can be reduced by means of a reducing valve to any figure necessary; and, as an extra safeguard, it should be the invariable rule to have a safety valve on every line of steam pipe used for feeding cooking apparatus.



Vertical Cross-Tube Boiler.

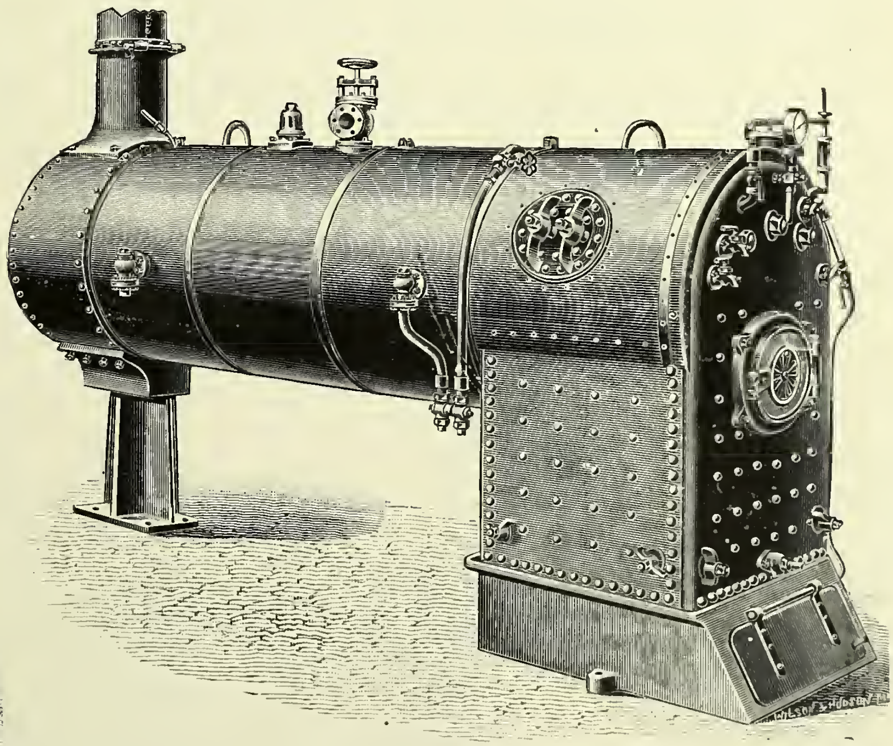
The most useful boiler for small installations is the vertical cross-tube boiler, which is commonly made in sizes of from ½ to 20 horse-power. Its efficiency is much improved by being well covered with a good non-conducting material; and if the water used is hard, it pays well to clean away the scale and sludge frequently from the inside.

Another very useful boiler, not requiring so much height as the vertical boiler, and usually more economical in fuel, is the locomotive type, as illustrated.

Both of these types of boilers can be readily combined with steam engines. For the production of large quantities of steam, the Lancashire steam boiler (see page 368) is now most generally employed. It is costly, and requires a good deal to build it and provide it with a chimney, but it repays the cost by its great economy in steam production. The burning gases from the fires pass along the centre of the boiler, return along the sides of the boiler by side flues, then pass underneath and heat the bottom of the boiler from below. The hot gases are therefore longer in contact with this boiler than in the other types of boilers, and a correspondingly greater quantity of heat is abstracted from them and utilised in the production of steam.

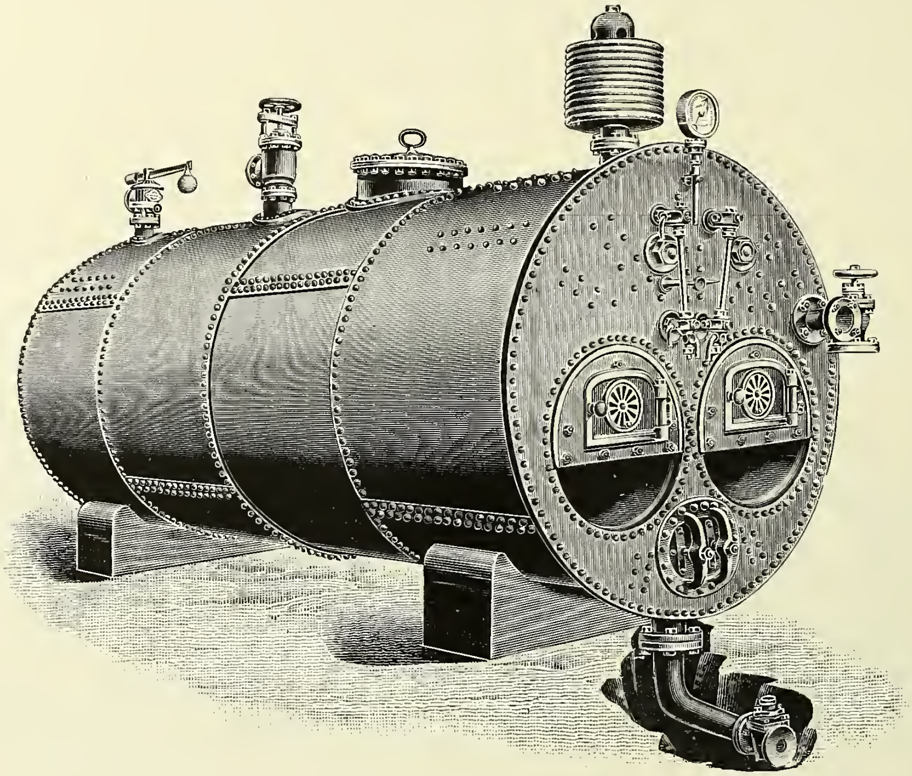
Steam Cookers.—see Ham Cooking.

Steam Cooking.—*Cooking German or Luncheon Sausages by Steam.*—The fact that hams can more profitably be cooked by steam leads one to inquire why steam cooking should not be applied generally. The answer is, that there is no reason whatever why the same process should not apply to all cookable substances, whether they happen to

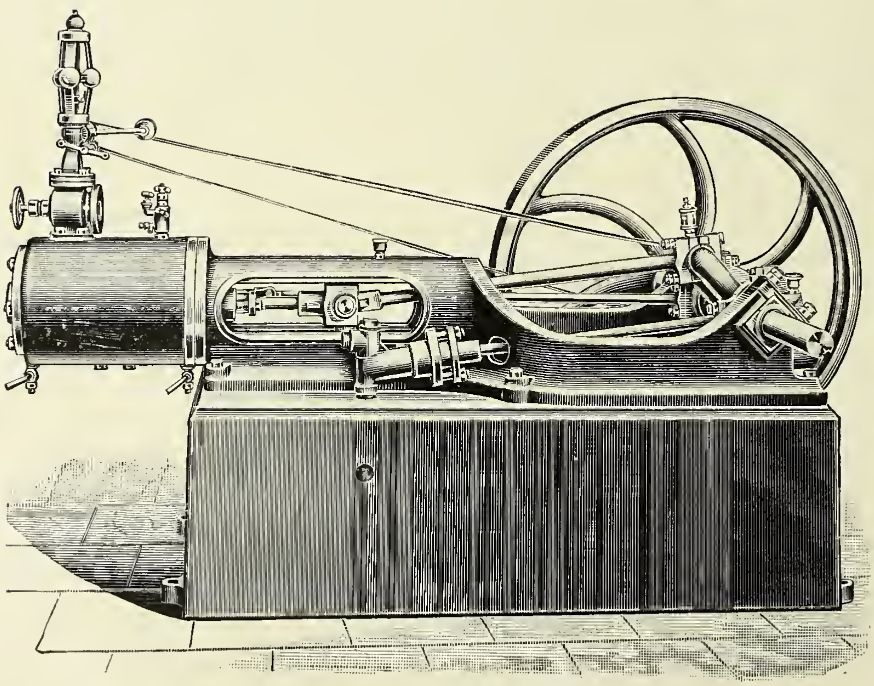


Steam Boiler. Locomotive Type.

be vegetable or animal. As a concrete example of where much economy in time and labour might be exercised, it may be stated that what are known as "German" sausages are more successfully cooked by steam than by water. An actual experiment, to ascertain the weight lost resulted in showing that 1 cwt. of sausage lost 2 lbs., the sausage being weighed when quite *cold.* The process is as follows:—Cook in cooker for two hours at 170° F., draw the cages with the sausages on them, and at once plunge the sausages into the solution of dye. (It should be ready and *boiling.*) Fish them out and lay on wire-netting racks, or hang up to cool.

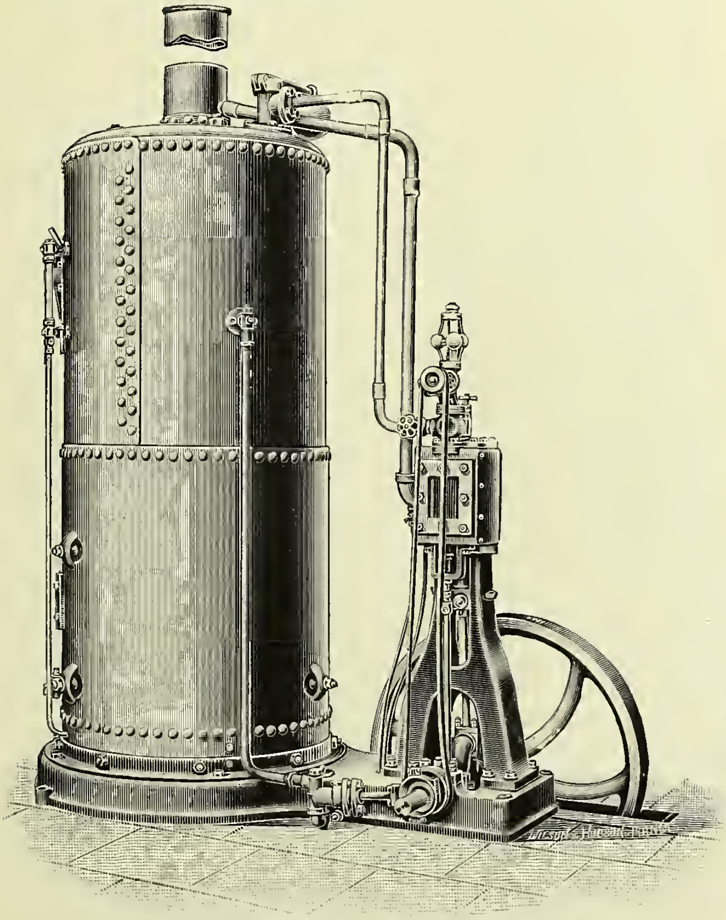


Lancashire Boiler.



Horizontal Steam Engine.

Steam Engines.—Modern improvements have greatly increased the efficiency of the steam engine. The use of steel plates in boilers permits of a higher range of pressures, and steam is supplied quite commonly at a pressure of 100 lbs. per square inch and upwards. More scientific governors, valves, etc., have also led to considerable economy in the use of steam. It is not necessary to speak of compound engines—so economical in use, especially where condensing water is cheap—as only the simple or one-cylinder engine is as a rule used in the food trades; the compound engine only being put in as a rule where large powers are required. The simple high-pressure engine of to-day, worked with high-pressure steam and with modern valves and governors, does much more work, size for size,



Vertical Steam Engine and Boiler combined.

than its predecessors. It does not pay to work an old-fashioned engine. It is cheaper to sell it for scrap and put in a modern machine. The gas engine having come to stay, the steam engine is not nearly so much employed as formerly for small powers; but still, where cooking or heating by steam has to be done, it is handy and cheap to have a steam engine for motive purposes.

Where the amount of steam and power required is not great, it is very convenient to have a vertical steam boiler and vertical steam engine combined. This is the best arrangement where space is a consideration.

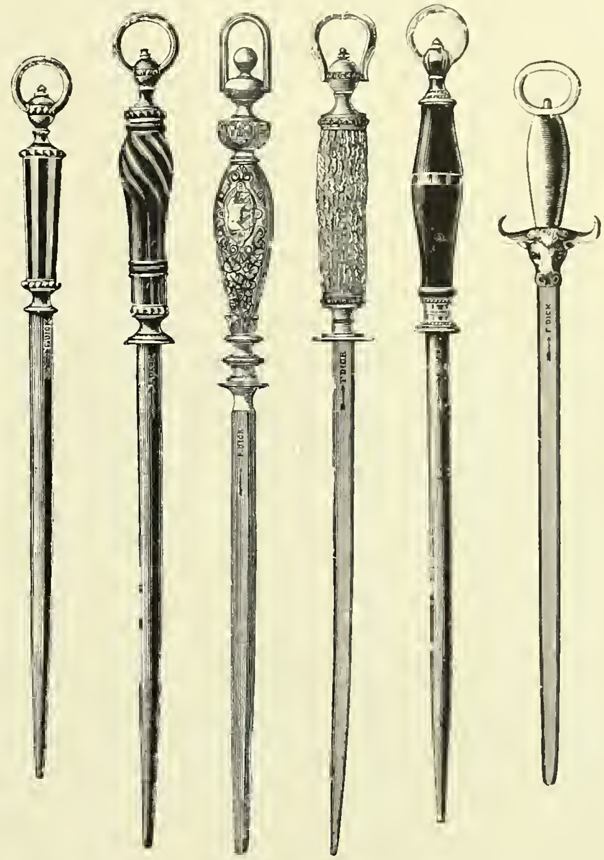
Steam Gauges.—see Gauges.

Steam Heating Pipes.—see Drying Room.

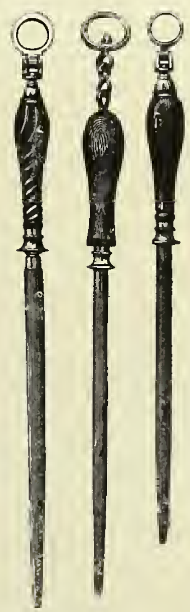
Steam Jacketed Pans.—see Boiling Pans.

Steelyard.—see Weighing Machines.

Steels.—Steels are so essential in every department of the food trades as to merit the term of indispensable.



German made Steels.



English made Steels.

Their shape is well known, and so also is their use. They are used for putting an edge on to knives which may by use have had the edge dulled or turned. Although apparently all made from bars of steel — the handles being ornamental — there are yet great differences in them. Some will not sharpen a knife at all because the metal is badly tempered. The ornamentation of the handle is no guide whatever. Only by a little practice can the virtues or disadvantages of a steel be discovered.

At one time Sheffield was pre-eminently the greatest steel manufacturing centre in the world. Now, however, that monopoly no longer exists, and steels are made in many countries, particularly in Germany, where in the cutlery producing districts steels of very fine quality indeed are to be had.

It will be observed from the illustrations that the German steel is usually more ornamental in appearance than the

English make. This artistic finish is a feature of every detail of the meat and food trades of Germany, and is one which might be with great advantage imitated in the United Kingdom. Not only are steels nicely finished, but hooks, bars, and shop fittings are all equally ornate.

Sterilizers —see Meat Sterilizers.

Stiff Disease in Pigs (Denmark).—see Breeding of Pigs (Denmark).

Stirrer.—see Lard Renderer's Tools.

Stove Hook.—see Hooks.

Striking Temperature.—see Temperatures for Bacon Curers.

Stringer.—see Ham Stringer.

Stuffed Pig's Head.—Cut the head from a young pig (which has a finely formed head) down as far as the neck piece, almost a hand's breadth under the ears. Cut out the bones, but be careful not to let the skin get broken, especially above the eyes where it is very thin. Then cut the flesh away from each side, leaving it only one-third of an inch thick. So that the head may not be shaky, cut away about a hand's breadth under the cheeks. Next sew with string into a neat shape, leaving an opening where the stuffing may get in. Measure this hole, and cut a cover for it from any skin left over.

The stuffing—Take 10 lbs. of young streaked pork, chop it coarsely. Add 5 oz. salt, and let it stand for twenty-four hours. Then take four eschalots, fry them in butter after mincing them fine, add them to the salted pork with $\frac{1}{2}$ oz. finely ground white pepper, $\frac{1}{6}$ oz. mace (fine), two handfuls fine green Pistachio nuts, $1\frac{1}{4}$ oz. fine Perigord truffles cut into dice; also one fine red salted boiled tongue cut into pieces the size of hazel-nuts. Mix all well together, and fill into the head. Sew it up, and hang for two hours in smoke until it is a yellowish-brown colour. Then roll up in a napkin, tie it tight on both sides of the head with string, just like a roly-poly. Boil for three to three and a half hours, according to size of head, then let it get perfectly cool. Then take the two ears which have got all rolled up, and dip them in hot water, so that they may afterwards stand up straight of their own accord. Put a piece of stick in each ear until they are cold again. The head should be chestnut-brown now. Make eyes by filling in the holes with fat and stitching a juniper-berry in the middle of each, or put in glass eyes. Now put a lemon and some laurel leaves in the snout, ornament the head with red and white jelly, and syringe with fat.

Stuffers.—see Sausage Fillers and Stuffers.

Sucking Pig (for Roasting).—Choose a pig from 3 to 4 weeks old, slaughter, scald with water not too hot, clean carefully, care being taken not to injure the skin (it may be singed with alcohol to remove the fine hair), remove the insides without cutting open the entire length, separate the ribs from the backbone, remove the latter and also the head bones. Take out the eyes, and salt before stuffiing. Chop $2\frac{1}{2}$ lbs. raw lean pork, $2\frac{1}{2}$ lbs. raw veal, 17 oz. raw fat pork, 5 lbs. fat white goose liver, several eschalots previously fried in butter, 26 oz. truffles cut in thin slices, season with 2 oz. salt and 1 oz. ground pepper, mix well with 6 raw eggs, sew up the opening, place the front feet forward, the hind legs drawn under the body, decorate as in "Filled Head."

Sugar.—see Cane Sugar.

Sugar Feeding.—see Molasses or Sugar Feeding for Pigs.

Summer (or Cervelat) Sausage.—To equal parts of good beef and lean pork add one-fourth of the amount of fat pork. Trim the beef free from sinews and beef fat, chop fine, then add the lean pork; chop again and add the fat pork in small squares. Chop until well mixed, adding salt and pepper to suit the taste. Stuff into hog bungs or beef middle casings very tightly, and hang in the open air 4 or 5 days. Smoke very slowly 3 to 5 days. To remove the white appearance that they sometimes have after being kept a while, rub with a cloth saturated with fat. This sausage may be kept from 4 to 6 weeks in winter time. By making summer sausage the same as above, but allowing the meat to be very coarse, it is called Salami. It will remain good perhaps a greater length of time. Care should be taken not to allow any unfilled places in the sausage casing, and no water should be added. Casings to be used for summer sausage should be thoroughly washed and soaked in water 24 hours before using to entirely remove the salt.

Suet Chopper.—The old fashioned vertical meat chopping machines have been much used of late for the cutting up of suet. They certainly are well adapted for the purpose, inasmuch as they make a clean cut and leave the suet in a friable condition.

These machines are made in various sizes for both hand and power. The latter varying from a 19 inch block with a capacity of 16 lbs. up to a 32-inch block with a capacity of 100 lbs.

Swine Fever.—In January 1896 the Board of Agriculture issued a circular to all interested as follows:—

The Board of Agriculture desire to call the attention of farmers and pig-owners generally to the fact that successful results from the measures now being carried out in their interest cannot be anticipated unless all connected with the trade are prepared to give active and vigorous assistance towards checking the spread of the disease.

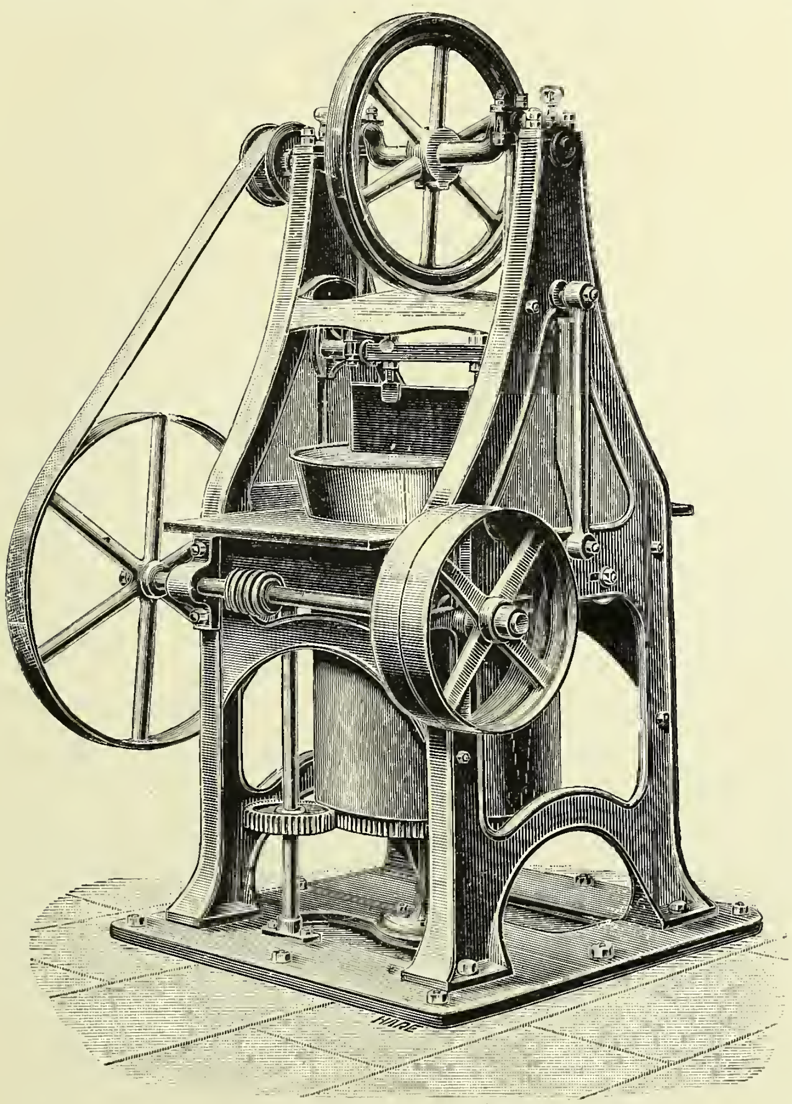
Owners are urged to refrain from selling any part of their stock unless they are satisfied that no disease exists on the premises from which the animals are to be moved.

Purchasers of swine should invariably keep newly-acquired animals separate for at least a fortnight before permitting them to be brought into association with the home herd.

There seems reason to believe that the disease is not infrequently introduced by means of persons who have been in contact with diseased animals. Pig-owners, therefore, are advised to prevent strangers from at any time approaching their pigs, and should the admission to the premises of spayers or castrators be necessary, those persons should be required, before approaching the animals, to thoroughly wash their hands with soap and water, and to wash and disinfect their boots with a solution of carbolic acid and water, or some other suitable disinfectant. Such persons might also with advantage be required to wear, while operating, a

waterproof apron, which should be washed and disinfected before the wearer is permitted to approach the animals to be operated on.

The cleanliness of the styes, and the feeding of swine on suitable food, are measures which, although not directly calculated to protect the animals from swine fever, are nevertheless very desirable with a view of keeping them in a healthy condition, and of giving them power to resist infection.



Suet Chopping Machine.

The Board would also call attention to the importance of the prompt notification of the appearance of any symptoms of swine fever, where the owner has any reasonable grounds for suspecting that it exists. Every person having in his possession or under his charge a pig affected with, or suspected of, swine fever, is required by law to give notice of the fact with all practicable speed to a police constable, and there can be no doubt that the success of the measures taken to prevent the spread of the disease will greatly depend upon the promptitude with which its existence is notified.

Swiss Potted Head.—Take two pigs' bladders; cut them open, and lay for a day in a salt pickle. Then salt the ears, the tongue, and the forelegs of a pig. Boil until tender, and cut into large slices. Make a paste of 6½ lbs. of good veal, chopped very fine, 2½ oz. of salt, ½ oz. of ground pepper, ⅓ oz. of cloves, and ⅙ oz. of ground ginger. Lay one of the bladders on a table, then put on it a thin layer of veal paste; on that put a layer of slices of pork and tongue, then another layer of veal paste, and so on until both are used up. Then lay the second bladder on the potted head, and wrap the head in a cloth. Tie it up fast, and boil gently for three or four hours. Press it for twenty-four hours under a heavy weight, take off the string and cloth, and it is ready.

Swivel Hook.—see Hooks.

TABLES.—A light table, which can be easily taken asunder for stowing out of the way, is very necessary in shops and factories. The multifarious uses of tables need hardly form the subject of a prolonged description, but the fact that in many premises room is of great value is a factor which has to be dealt with. Whether it is in the shop or the workroom, the army pattern of table is the best that can be adopted. These are made in two sizes, viz., 6 ft. by 2 ft. 6 in., and 4 ft. by 2 ft. 6 in. They are made in the strongest possible way to stand rough usage; the timbers are all fastened together with iron dowels; the corners are bound with iron, and each table top is, in addition, securely held together with iron bolts passing right through from side to side. The stand is made of malleable iron, and the top is fitted to the stand by notches in the iron casing. The whole table can be taken to pieces in less than a minute, and stowed flat against the wall or on the rafters out of the way. These tables are extremely handy for butchers, sausage makers, caterers, and to any one else requiring a strong table that can readily be taken to pieces and stowed away into small space (see page 372).

Tanks for Scalding Pigs.—see Pig Scalding Tanks.

Tanned Pig Skins.—see Pig Skins (Tanned).

Tasmania.—The agricultural and live stock returns for Tasmania for the year 1898-99 gives the number of live stock in the Colony as follows:—

Horses - - - -	29,797
Cattle - - - - -	110,733
Pigs - - - - -	45,274
Sheep - - - -	1,493,638
Milch cows - - -	37,825

The importation and slaughtering returns show that 71,237 sheep and lambs, 1,968 horned cattle and calves, and 154 pigs were imported; and 104,303 sheep and lambs, 10,029 horned cattle and calves, and 6,188 pigs were slaughtered. The imports are for the whole Colony, and the slaughtering returns are for Hobart and Launceston only.

The relative value of pastoral produce was estimated for the year at :—

Milk, butter, and cheese - -	£378,250
Cattle - - - - - -	212,767
Sheep - - - - - -	140,029
Pigs - - - - - - -	113,185
Horses - - - - - -	23,536
Wool exported and consumed locally	277,093
Live stock exported - - -	23,536

The returns for live stock show decreases, as compared with 1898, as follows :—

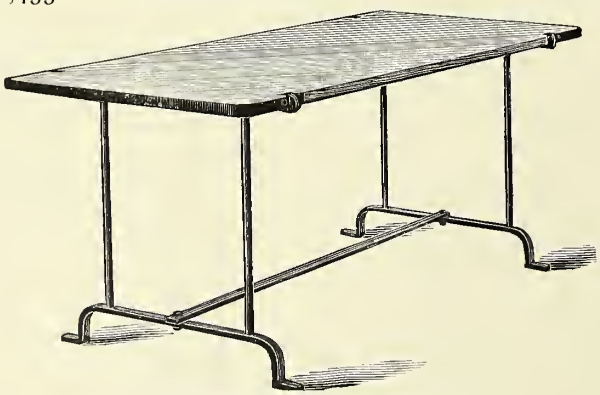
Horses - - - - -	101
Cattle - - - - - -	5,458
Milch cows - - - -	3,470
Sheep - - - - - -	84,973

and an increase in pigs of 1,754.

From 1897 there has been a continuous decline in the number of milch cows kept, and, in consequence, there is an increasing difficulty in supplying local wants. The abnormal increase in the imports of such articles as butter and cheese, giving at a glance the result to the Colony :—

Butter, cheese and lard imports for 1897 - 417,877 lbs.
Do. do. 1898 - 1,000,459 lbs.

Fortunately, the bulk of this increase has been imported from other Colonies near at hand, the deficiency has been made good in as cheap a way as possible, and the supplying Colonies have considerably benefited. There are seventeen butter and dairy factories and eight bacon factories in the Colony. In 1897 the former produced 572,466 lbs. of butter and 26,381 lbs. cheese; while the latter cured 258,433 lbs. of hams and bacon.



Army Pattern Table.—see page 371.

Temperatures.—

	Fahr.
Water boils - - - - -	212°
Wax melts - - - - - -	149°
Tallow melts - - - - -	92°
Acetic acids congeals - - - -	50°
Olive oil congeals - - - -	36°
Water freezes - - - - -	32°
Milk freezes - - - - -	30°
Vinegar freezes - - - - -	28°
Sea-water freezes - - - -	28°
Strong wine freezes - - - -	20°
Turpentine freezes - - - -	14°

Temperatures for Bacon Curers.—

Cellars - - - -	42° F.
For striking - - -	40° to 44° F.
Chill rooms - - -	38° F.
Smoking - - - -	80° to 90° F.
Pale drying-rooms - -	85° F.

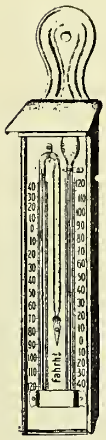
On the temperature of meats everything depends, hence all the elaborate arrangements which of late years have been made in chill rooms and cellars. In chill rooms the temperature required is 38° F., and dry, whereas the temperature of cellars should be 42° F., with a certain amount of humidity. It is essential that these temperatures be accurately kept. Hence the necessity for a thermometer which can be kept in the pocket. The thermometer generally adopted is very small, and is graduated so as to give fairly wide degrees, which make it easier to read. The point of the mercury bulb is fairly sharp, so that it can be pushed into the meat. When using it in this way it should be left some little time, so that the temperature of the glass and the meat may become equalised.

Tenderloin Sausage.—Take the tenderloins, cut them as near the shape of a sausage as possible, rub with hot salt, and place for two weeks in a vessel containing a solution of 17 oz. of salt boiled in five pints of water; remove, wash and stuff tightly in beef bungs. Smoke for two weeks.

Thermometers.—All kinds of substances, when heated, expand; that is, they occupy a larger volume than when they are cold. The thermometer, an instrument for measuring the degrees of temperature, is constructed by taking advantage of the above principle. It is made as follows :—A glass tube with a narrow bore is sealed up at the one end by melting in a blow-pipe flame, and a small bulb is then blown on the closed end; the other end is dipped in mercury or alcohol, and as the bulb cools the mercury rises in the tube, which is heated until the bulb and tube are full of mercurial vapour. The end of the tube is again dipped in mercury, and as the tube cools it fills entirely with mercury. Further heating expels any excess of mercury, and when the tube is full of mercurial vapour, the open end is sealed up by melting with the blow-pipe. As the tube cools the mercury sinks down towards the bulb, and the upper part is completely empty and free from air. The tube is graduated as follows :—It is dipped in a mixture of ice and water, and the height of the mercury on the stem marked. This mark gives the freezing point of water, and is called 32° on the Fahrenheit scale, and 0° on both the centigrade and Reamur scales. The bulb of the thermometer is then placed in boiling water, and the height of the mercury again marked, the difference between the height of the freezing point and the height of the boiling point is then divided accurately into 180° for the Fahrenheit scale, starting at 32° and ending at 212°. On the centigrade scale the same space is divided into 100°, and on the Reamur scale 80°, while on the last-mentioned the scales are extended above and below the boiling and freezing points in the same proportion.

A mixture of ice and salt gives a temperature of 0° Fahrenheit; and the inventor of this scale thought that this was the lowest possible temperature, so he started his scale with it, thus making his temperature for the freezing

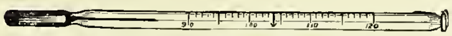
THERMOMETERS.



Maximum and Minimum Thermometer.

Floating Dairy Thermometer and Lactometer combined.

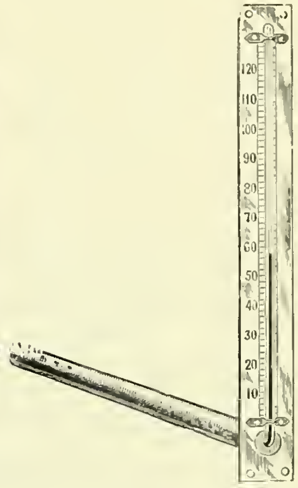
Meat and Bacon Testing Thermometer.



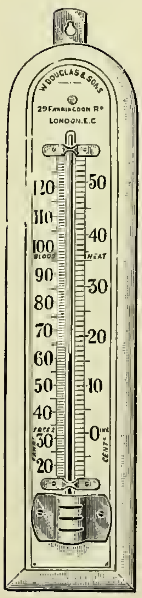
Incubator Thermometer.

Chamber Drop Thermometer.

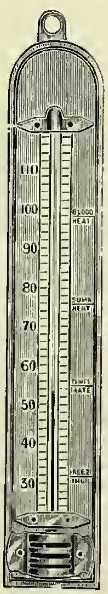
Extra Strong Metal Frame Chamber Thermometer.



Chamber Thermometer with Strong Brass Frame.

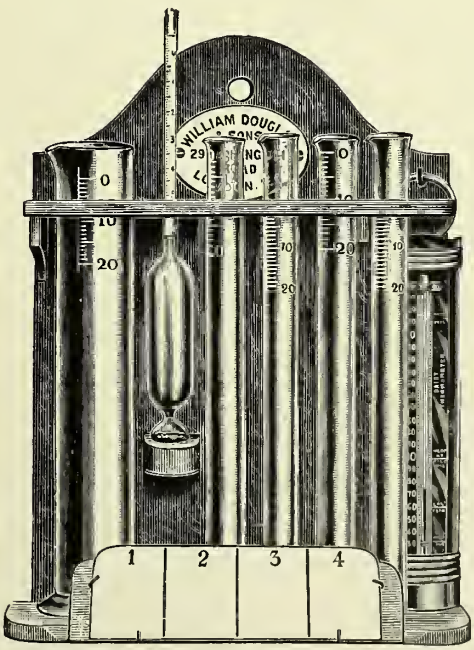


Porcelain Thermometer.

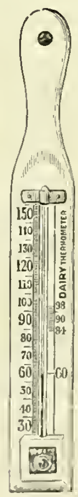


Boxwood Thermometer.

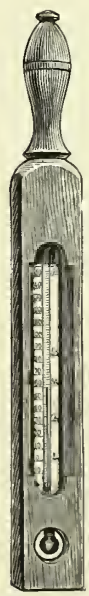
Floating Dairy Thermometer.



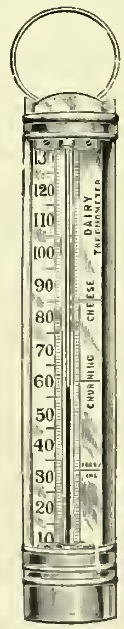
Complete Set with Stand for Dairy Purposes.



Porcelain Dairy Thermometer.



Dairy Thermometer.



Zinc Scale Thermometer.

of water 32°, whereas 0° is made the freezing point on the other scales. We have now attained to temperatures hundreds of degrees below the zero of Fahrenheit.

Reaumer.	Centigrade.	Fahrenheit.	Reaumer.	Centigrade.	Fahrenheit.
+80	+100	+212	+23	+28·75	+83·75
79	98·75	209·75	22	27·50	81·50
78	97·50	207·50	21	26·25	79·25
77	96·25	205·25	20	25	77
76	95	203	19	23·75	74·75
75	93·75	200·75	18	22·50	72·50
74	92·50	198·50	17	21·25	70·25
73	91.25	196·25	16	20	68
72	90	194	15	18·75	65·75
71	88·75	191·75	14	17·50	63·50
70	87·50	189·50	13	16·25	61·25
69	86·25	187·25	12	15	59
68	85·	185	11	13·75	56·75
67	83·75	182·75	10	12·50	54·50
66	82·50	180·50	9	11·25	52·25
65	81·25	178·25	8	10	50
64	80·	176	7	8·75	47·75
63	78·75	173·75	6	7·50	45·50
62	77·50	171·50	5	6·25	43·25
61	76·25	169·25	4	5	41
60	75·	167	3	3·75	38·75
59	73·75	164·75	2	2·50	36·50
58	72·50	162·50	1	1·25	34·25
57	71·25	160·25	0	0	32
56	70·	158	−1	−1·25	29·75
55	68·75	155·75	2	2·50	27·50
54	67·50	153·50	3	3·75	25·25
53	66·25	151·25	4	5	23
52	65	149	5	6·25	20·75
51	63·75	146·75	6	7·50	18·50
50	62·50	144·50	7	8·75	16·25
49	61·25	142·25	8	10	14
48	60	140	9	11·25	11·75
47	58·75	137·75	10	12·50	9·50
46	57·50	135·50	11	13·75	7·25
45	56·25	133·25	12	15	5
44	55	131	13	16·25	2·75
43	53·75	128·75	14	17·50	0·50
42	52·50	126·50	15	18·75	−1·75
41	51·25	124·25	16	20	4
40	50	122	17	21·25	6·25
39	48·75	119·75	18	22·50	8·50
38	47·50	117·50	19	23·75	10·75
37	46·25	115·25	20	25	13
36	45	113	21	26·25	15·25
35	43·75	110·75	22	27·50	17·50
34	42·50	108·50	23	28·75	19·75
33	41·25	106·25	24	30	22
32	40	104	25	31·25	24·25
31	38·75	101·75	26	32·50	26·50
30	37·50	99·50	27	33·75	28·75
29	36·25	97·25	28	35	31
28	35	95	29	36·25	33·25
27	33·75	92·75	30	37·50	35·50
26	32·50	90·50	31	38·75	37·75
25	31·25	88·25	32	40	40
24	30	86·	...	...	...

Thuringian Red Sausage.—14 lbs. thick streaked pork off the belly part (half tenderly cooked), cut into ¼ inch square dice; 3 lbs. boiled pigs' rind, 4 lbs. raw liver and lungs, finely minced. This may be varied by substituting salted boiled tongue or salted boiled heart, cut into pieces of equal size.

Now put 8 lbs. of blood into a tin dish, and then into a big pot, and stir *constantly* until hot. Add first the rind, liver and lungs, and stir well, and then the pork. Season with 1½ lbs. fine salt, 3 oz. white pepper, 1 oz. ground marjoram, ⅓ oz. ground caraways, ⅓ oz. finest cloves. Work all thoroughly together, and as quickly as possible fill the hot meat into the widest pigskins you have. Give plenty of room, and then put at once into water which is *boiling hard*; stir constantly. Prick this sausage often, and cook at a temperature of 212° Fahr. It is ready when, on pricking, the fat which exudes is perfectly clear. Smoke in cold smoke, with some juniper-berries in the sawdust.

Thyme.—see Culinary Herbs.

Tile Work.—see Shop Fitting.

Tin Tickets.—see "Climax" Tickets.

Tomato Sausages.—Mutton, 6 lbs.; mutton fat, 8 lbs.; tinned tomatoes, 3 lbs.; sausage meal, 1½ lb.; scalded granulated rice, 1 lb.; beef sausage seasoning, 10 oz.; rose-pink colour, made into a paste, about 2 oz.

Seasoning.—Salt, 9 lbs.; white pepper, 7 lbs.; ground nutmeg, ½ lb.

Method of Preparation.—Cut the pork up fine in the machine, then add the tomatoes, after which add the sausage meal and granulated rice, then the other ingredients. See that the proper colour is attained before withdrawing from machine. If it is not strong enough, add some more rose-pink colour until the shade is correct. Fill in hog casings and link six to the pound.

Notes on Ingredients.—Tinned tomatoes are much more economical than fresh ones, but if the fresh fruit is easily obtainable by all means let it be substituted. A less quantity of the rose-pink colour is required when fresh fruit is used.

Tongue and Beef in Glass Moulds.—see Beef and Tongue in Glass Moulds.

Tongue, Chicken, and Ham Dye.—see Ham, Tongue, and Chicken Sausage Dye.

Tongue, Chicken, and Ham Sausage.—see Ham, Tongue, and Chicken Sausage.

Tongue Sausage—*No.* 1.—Make the same as blood sausage. To 40 lbs. of this add eight pickled hogs' tongues and two pickled beef tongues, cutting them into pieces two or three inches long, distributing equally throughout the casing. Stomachs are sometimes used for tongue sausage casings.

No. 2.—Take 45 lbs. of meat from the belly, 25 lbs. from the chuck bone, 20 lbs. from the neck, and 10 lbs. fat pork; cook together for one hour; remove and cut in small pieces; scald again and remove. Take 6⅛ lbs. hog's liver with hog's blood, sifted clean; mix well, then add 45 oz. salt, 9 oz. ground pepper, 2¼ oz. ground cloves, 1⅛ oz ground ginger, 3 oz. ground marjoram, and mix well with the balance. Cut 32 pickled hogs' tongues and 4 beef tongues in slices 3 inches long and of fair thickness. Stuff in a hog's stomach, hog bladder, or large calf's bladder, almost full, then distribute the slices of tongue among it; the pieces should be large enough so that 4 or 5 is all that is needed in one sausage. The cooking is the same as in blood sausage. Care should be taken to prevent the fat from collecting in one place. The stomach or large casings require about one hour, bladders about half an hour to cook.

No. 3.—Take 100 lbs. fresh fat pork cut in small pieces; mix it with 70 oz. of fine sow hog's liver. Sift in hog's blood and mix it with 18 oz. salt, $4\frac{1}{2}$ oz. ground pepper, $2\frac{1}{4}$ oz. ground cloves, 1 oz. ground ginger, $2\frac{1}{4}$ oz. ground marjoram. Work and mix the whole well. Stuff the same as in the preceding, adding 8 pickled beef tongues; each cut into 9 pieces, and each sausage containing 3 of these pieces.

No. 4.—Cook some bacon very lightly, then slice it into thin pieces, lay them on the top of each other, and let them get perfectly cool. Cut them then into small dice, pour boiling water over them in a sieve, let them dry. While they are drying, mince one third of the quantity of boiled pigs' rind very fine, and then mix the two together.

Take $7\frac{1}{2}$ lbs. back fat, $2\frac{1}{2}$ lbs. pigs' rind, $5\frac{1}{4}$ oz. salt, $\frac{3}{4}$ oz. white pepper, $\frac{1}{3}$ oz. peppermint, $\frac{1}{3}$ oz. ground cloves, $\frac{1}{4}$ oz. ground marjoram, $\frac{1}{4}$ oz. ground mace.

Mix all well together with a little pigs' blood. Now fill loosely into pigs' skins, putting into each bladder two or three salted boiled pigs' tongues regularly through the meat. Now boil the sausages until, when pricked, clear white fat rushes from the inside. Let them cool and dry, and smoke in cold smoke.

Tongues to Cure.—see Curing Tongues.

Track Weighing Scale.—see Weighing Machines.

Travelling Hook.—see Hooks.

Trays.—see Meat Trays.

Tripe Cleaning (the modern Scottish method).—There are three methods of cleaning tripes. One is primitive, generally that which the farmer's wife is conversant with, viz., allowing the stomach and its contents to lie for 24 hours, when the mucous membrane strips off easily. The second method is that in which lime is used. It is objectionable, as it makes the tripe soft, yellowish, and gives it a nauseous taste. The most approved method is that which is followed in the municipal abattoirs of Glasgow, viz., the tripes are scalded in water about 130° Fahr., at which heat the mucous membrane is loosened from the stomach and is easily manipulated.

In the Glasgow abattoir, the first stomach, after being scalded, is cleaned by machinery. Where such a large number has to be cleaned daily, this machine is necessary; but if some method were introduced so that the fibre on the backs of the tripes were not broken, it would be perfection.

Tripe Cleaning.

In the Paisley abattoir, the tripes there are cleaned by the hand instead of machinery, as in Glasgow. By the process in Paisley the "fleece" is kept on the tripes, and therefore can hold more water, an important component for the butcher in selling out. The other stomachs are cleaned in the same manner in both places.

There has been invented by Mr Durie, of Edinburgh, a machine for washing the mony plies. It is a large iron tank with a semi-circular cover. The plies are halved, put in, the cover shut down, and the revolving machine set in motion, and in a short time you have the plies ready for scalding. The mucous from off the fourth stomach is invaluable as a stimulus to cattle and horses suffering from indigestion.

Tripe Dressing by Hand (English method).—The first thing to attend to is to see that the tripes are cleaned immediately they are removed from the bullocks, for if left about any length of time they get stained, and depreciated in value. To deal with one bullock's tripe the following is a good plan :—Take three buckets of boiling water and add a little soda, and one pail of cold water in a tub. Throw the tripe into this, and stir with a stick until the dirt all comes off. Take the tripe out of the tub, hang it on a hook, and scrape with a very blunt knife until it is quite clean. Rinse the tripe now well in fresh cold water, then throw it into a copper with about five gallons of water. Add two ounces of alum to the water, and boil until the tripe becomes quite tender. The alum is used as a bleaching agent. Remove the tripe now from the copper, and place in a running stream, if possible, of fresh clear water. If that is not possible, it must be put into a large quantity of water and frequently stirred round in it. When it is quite cold take it out and remove the thin inside skin, and also trim it. Now throw it into a bath of cold water, to which has been added about 10 per cent. bi-sulphite of lime, and remove for sale or use. At night the tripe should be returned to the water bath, and in summer it should be washed often in this bath to keep it sweet.

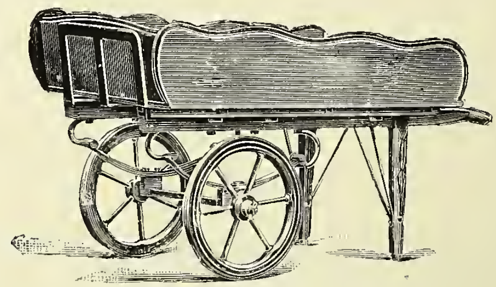
Tripe Dressing (London Style).—As soon as possible after the tripe is removed from the animal wash it very thoroughly, being careful to prevent any of the impurities going into the smooth part. Rinse in cold water, put it into a tub with two handfuls of lime and a pail of tepid water. Soak for an hour, then scrape well in the same water. Rinse in fresh water, wash again on both sides, and finally rinse in clear cold water.

Tripe Dressing (German Style).—The sooner dressed when taken out of bullock the better. Gut of steers are the best. Take three buckets of boiling water, add a little soda and one pail of cold water in tub. Throw your tripe in and stir till the dirt comes of with a stick. Take the tripe out of tub, hang on a hook and scrape until quite clean with the back of a knife. Place then in clean cold water, and use plenty of it. Then throw the tripe into a copper of cold water, add 2 oz. of alum with water. Boil until quite tender—the alum keeps the tripe a nice white colour. Take out of copper and place in cold water. Run on it until quite cold, then take the thin skin off that is inside, and trim up, then place the tripe in bi-sulphite of lime, that is to say in a weak brine for a little time. Bay salt is the best for tripe to keep. When tripe is sold in a shop it should always be put in clean water over-night first and then be washed in the above brine. That takes the slime off. Then place it in water until morning. In summer it should be washed often during the day.

Troughs.—see Meat Troughs.

Trucks.—There is a great variety of trucks in use, and the illustration shows one of the most useful in the food trades. (The bacon factory truck is described and illustrated under the heading of Bacon Truck). The hand cart is a very serviceable meat truck, fitted with a box for small packages. This box is detachable, so that by taking it off, the truck becomes an open hand truck.

For those who prefer a closed in truck or hand cart several designs are made for butchers, sausage, pie, and small goods makers. The goods are protected from dust and inclement weather, and by running a board along the ridge and using the sides of box, very effective advertisements may be obtained.



Combined Truck and Hand Cart.

Box hand carts may also be mounted on tricyle frames, and, as such, become efficient swift delivery vehicles. An illustration and description of this kind of carrier will be found under the heading "Cycle Carrier."

Truffle Goose Liver Sausage.—see Liver Sausage.

Truffled Liver Sausage.—see Liver Sausage.

Truffles.—Are delicate flavoured tubers much sought after. They grow mostly in the South of France, and principally in the vicinity of oak trees. Attempts to plant them in various countries have utterly failed, and the exact conditions under which they can be reproduced are not known. They grow in scattered patches at a depth from 2 to 12 inches in the earth in light sandy soils, and are gathered between October and March. Dogs are trained to scent them out, and pigs also are trained in the same way. It is said that the sense of smell of the pig is even keener than that of the dog. Whether that is so or not, it is quite an established custom in the districts where truffles are found to keep pigs for the special purpose of scenting and rooting them out.

There are two principal kinds of truffles, the black truffle (*tuber aestirum*) and the white (*choiromyces albus*). The black truffle is of a dark blackish colour and warty appearance; it grows in size like a large plum, and even bigger. It is found in more general distribution than any other. The white truffle has not the same delicacy of flavour as the black, and is not so much sought after. Truffles are used in sausages and in many other dishes.

Truffle Sausage.—Take 60 lbs. of fresh hogs' livers scalded clean and white, 25 lbs. of cooked fat from the intestines, 15 lbs. raw fat pork, chop fine and add 4 lbs. boiled and prepared truffles cut in small thin slices, 33 ozs. salt, 10½ oz. ground pepper; this is all the spice that is necessary, as more will spoil the flavour of the truffle. To this add one pint of wine, mix the whole and stuff into hog casings, cook ¾ of an hour. Smoke and treat in the same way as with plain liver sausage.

Tuberculosis (Prevention of, in the United States).—Dr D. E. Salmon, the Chief of the Bureau of

Animal Industry, reports as follows for the year ending 30th June 1900:—

Since the discovery of the diagnostic value of tuberculin in bovine tuberculosis in 1891, there have been many official tests made in the United States to ascertain the extent to which the disease exists, and to diminish the number of affected animals. While numerous herds have been found diseased to a remarkable and even alarming extent, the consensus of opinion is that, considering all the cattle in a State, not over five per cent. of the animals would react to the test even in our dairy sections, and not half of one per cent. of the cattle killed under the Bureau inspection is found tuberculous. In certain districts, however, the disease is much more frequent, and the astonishing degree to which it may develop in a herd before its presence is discovered by the owner and much less by others has led to a demand for investigation and for repressive measures.

A considerable number of States have laws and regulations made for the purpose of preventing the introduction of tuberculous cattle from other States or foreign countries. While these differ much in detail, the general plan is to require that cattle introduced for breeding or dairy purposes be tested with tuberculin and their healthfulness certified by the authorities of the States from which they originate, or, failing in this, by the authorities of the State where they are destined to remain. The weak points in this system are, first, that many States from which cattle are shipped have no officials to make the tests, and none with authority to issue certificates; second, that very few of the receiving States have a sufficient veterinary force to make the required tests; and, third, that the numerous and varied requirements of the several States are confusing to shippers, difficult to comply with, and a serious burden to interstate commerce. The situation is not unlike that which existed fifteen years ago, when nearly every State had a quarantine against the cattle of every other State to guard against the introduction of contagious pleuro-pneumonia.

This Bureau has endeavoured to assist the individual States in guarding against infection from other States and from foreign countries, as contemplated by its organic act. Notice has been given that it is a violation of the federal statutes to ship animals affected with tuberculosis from one State to another. Cattle imported from Canada for breeding or dairy purposes are required to be accompanied by a certificate of healthfulness shown by a tuberculin test made by an official veterinary surgeon, while those from other countries which pass through the quarantine stations are tested during the period of detention.

The certificates of tests made in the country of origin have frequently been unsatisfactory, and it has been determined to make immediate arrangements to have imported cattle tested by officials of this Government. It is thought that the cattle from Great Britain may be tested before they leave that country, and the importers thus saved from the loss which is inevitable if they are tested here.

The effort to control tuberculosis is a most reasonable and proper one, and if conservatively directed should receive the support of every friend of the cattle industry. Not only is tuberculosis one of the worst scourges of the bovine race, attacking as high as ninety per cent. of the animals in individual herds, but its existence is believed by the best sanitary authorities to be a serious menace to the health of the consumers of meat and dairy products. It is therefore a disease to be dreaded, not only because of the value of the cattle which it injures or destroys, but because it threatens mankind with an incurable and fatal infection. The individual States, therefore, have good reason for desiring to stop the importation of the tuberculosis contagion, and for adopting measures intended to lessen or control the disease within their own territory.

Tuberculosis unfortunately is not confined to cattle, but also affects swine, and in these animals is more acute and more likely to involve the edible portions of the carcase. There is good reason to believe that the disease is becoming more frequent with swine, probably on account of feeding the mixed milk returned from creameries. A single tuberculosis herd of cows might in this manner infect the greater part of the swine in a considerable district. While this method of propagating the disease could be easily guarded against by sterilising the milk, it appears that this simple precaution is usually neglected.

The herds of the United States are far less seriously affected with tuberculosis than are those of European countries, notwithstanding the fact that none of our States feels able to adopt and enforce systematic and thorough measures for the immediate control of this disease. The proportion of animals affected in Europe indicates both the danger which threatens our herds, if the disease is allowed to progress here, and the importance of thorough measures to prevent the introduction of diseased breeding stock from abroad.

Recent figures from reliable sources show that of 4,256 cattle tested in Moravia, Austria, 1,553, or 36·48 per cent. were tuberculous. The slaughter-house statistics of Amsterdam show an increase in the percentage of tuberculosis among adult cattle from 1·76 in 1888 to 13 in 1898. In France, according to Nocard and Leclainche, Champagne, Lorraine, and Brie are highly infected, the number of tuberculous cows in some regions reaching 15 to 20 per cent; veterinarians estimate that the proportion of tuberculous cows in Beauce exceeds 25 per cent.; in Brittany and Nivernais the disease is making frightful progress; in the Hautes Vosges 30 to 40 per cent. of the milch cows are said to be tuberculous, while in the south east the proportion is greater still, and in certain valleys of the Pyrenees exceeds 50 per cent. In Denmark, of 67,263 cattle tested from 1896 to 1898, 32·8 per cent. were found tuberculous. In Belgium 48·88 per cent. of cattle reacted out of a total of 20,850 head tested. Recent slaughter-house statistics from Germany show that the cattle slaughtered are affected with tuberculosis as follows:—At Berlin (1897), 20·63 per cent.; Magdeburg (1897), 24·1 per cent.; Bromberg (1896), 27 6 per cent.; Lubeck (1896), 33 per cent.; Leipsic (1897), 36·4 per cent.; Stolp (1898-99), 37·7 per cent.; and in the whole of Saxony (1898), 30·46 per cent.

In Great Britain the investigations have not been so extensive as in some other countries; but, according to M'Fadyean, 15,392 head of cattle were tested during three years with tuberculin supplied by the Royal Veterinary College, and of these 4,105, or 26 per cent., reacted. These animals were located in all parts of England, with a few in Ireland, Scotland, Wales, and the Channel Islands. Four veterinary surgeons tested 80 pure-bred shorthorns for export, and 34 of these, or 42 per cent., reacted.

These facts show the almost universal distribution and the serious extent to which tuberculosis prevails among the cattle of Europe. We might almost question the advisability of further importations from such badly diseased herds; but

certainly if importation is allowed it should be under the strictest supervision, and with the adoption of every precaution to prevent violation or evasion of the law which prohibits the importation of diseased animals.

There have been made and distributed during the year 33,400 doses of tuberculin, which were supplied to local authorities as a means of co-operation for the suppression of the disease. The greater part of this was used by the States of Minnesota, Vermont, and Illinois, but a considerable quantity was sent to Michigan, Iowa, New Jersey, and California, and a small amount was supplied to the War Department, the Marine Hospital Service, and to inspectors of the Bureau of Animal Industry for official use. The use of tuberculin as a means of discovering tuberculosis has been less extensive in the United States during the past year than in some previous years, owing, it appears, to a sentiment which has been created against it by those who oppose work for the suppression of this disease. The value of this agent has been thoroughly established by scientific investigation and practical use, and no well informed veterinarian would at the present day undertake to conduct any effectual operations for eradicating this disease without its aid in selecting the affected animals. While, therefore, certain States may temporarily abandon the use of tuberculin, they are sure to return to its use when they seriously attempt to control the disease, since its aid is indispensable to intelligent and efficient action.

The Bureau has recently made a test of the herd of cattle belonging to the Government Asylum for the Insane, at St Elizabeth, D. C., which serves as an additional illustration of the great value of tuberculin. The presence of tuberculosis in this herd was revealed accidentally. A number of the dry cows were running in a field, where they were undoubtedly bitten by a rabid dog, as 18 of them died of rabies in the course of two weeks. In making the post-mortem examination to discover the cause of death, at least 12 of them were found extensively affected with tuberculosis. This led to the entire herd being tested with tuberculin by the pathological division of this Bureau. Of the 102 animals tested, 79 gave a decided reaction, making the proportion of animals affected more than 77 per cent. As 13 of the 23 animals which did not react had but recently been purchased from a farm in Virginia, it will be seen that more than 90 per cent. of the old herd reacted to the test.

Advantage has been taken of this opportunity to test the ineffectiveness of milk from cows which have reacted to the tuberculin test, but which on physical examination are apparently healthy. A large number of feeding and innoculation experiments are in progress, in which about 700 experimental animals are being used. The results, which will be of great value from a sanitary point of view, will be submitted for publication as soon as the experiments are completed.

UTILISATION of Bones—see Bones (the best means to utilise them).

VALVE Box.—A box or casing generally made of cast iron and shaped according to the valves it has to accomodate —such as the suction and delivery valves of refrigerating machines, pumps, etc., also the steam chest which contains the slide valve of an engine.

Vanilla.—A species of orchid indigenous to the hot regions of Eastern Mexico. It is also grown in Peru and other places on the American continent, the West Indies, and the Indian and Pacific Islands. It is a climbing plant, rather fleshy, with large inodorous flowers of yellowish green and white colours, which in turn yield the bean or pod which is gathered when nearly ripe and dried in the sun.

The culture of vanilla is carried out by fastening shoots about three feet long to trees on the approach of the rainy season; these are fastened to keep clear of the ground. The roots strike into the bark of the tree and form plants which fruit in about three years and remain productive for about thirty years. It is essential that the plantation should be kept clear of weeds and undergrowth. The pods are from seven to nine inches in length, dark in colour, and the split should not extend to more than a third of their length. A popular method of preparing vanilla for the market is described as follows:—"About 12,000 of the pods are strung together by their lower end as near as possible to the footstalk; the whole are plunged for an instant into boiling water to blanche them; they are then hung up in the open air and exposed to the sun for a few hours. By some they are wrapped in woollen cloths to sweat. Next day they are lightly smeared with oil by means of a feather or the fingers, and are surrounded with oiled cotton to prevent the valves from opening. As they become dry, on inverting their upper end, they discharge a viscid liquor from it, and they are pressed several times with oiled fingers to promote its flow. The dried pods, like the berries of pepper, change colour under the drying operation, grow brown, wrinkled, soft, and shrink to one-fourth of their original size. In this state they are touched a second time with oil, but very sparingly, because with too much oil they would lose some of their delicious perfume."

Vanilla is largely used for flavouring confectionery, ices creams, chocolate, and other eatables, and acts on the system as an aromatic stimulant, exhilarating the mind and increasing the physical energy. Besides its use in eatables, it is also largely used in perfumery and for scenting tobacco, snuff, and cigars. The gathering in of the crop takes place about the end of September in each year.

Vanilla Essence.—A liquid preparation obtained by soaking the pods in rectified spirits—see Essences.

Vans.—see Insulated Vans.

Vat for Canning.—see Canning.

Veal.—Veal is best in the early part of the spring, and should be eaten soon after being killed. A good veal should be of fair size, weighing from 125 to 150 pounds, and dress a little over two-thirds of that amount with the skin on. The meat should be juicy, fat, finely grained, white and firm. If the calf is too large, the meat will be coarse and tough. The fat should be firm and of a whitish colour.

Veal, being more difficult to keep than other meats, is perhaps the most risky for a butcher to handle, as it is neither suitable for smoking nor corning, though it may be made into sausage. The best grade of veal is the milk calf, raised on the mother's milk. Stall-fed calves rank next and may be nearly as good. Both of these are at their best when about two months old, and their meat is very delicate. Calves raised on buttermilk and slops are poor and thin. The meat has a reddish tinge, the kidneys a dark colour, and no fat about them. The meat of grass-fed calves is much like beef, though not nearly as good as either beef or veal, and should be worked into sausage meat. The

meat of a calf less than four weeks old is termed Bob veal, and usually weighs less than 60 pounds when dressed. They are unfit for food and liable to confiscation by the health department. The meat is bluish, watery, and gelatinous.

Veal should never be allowed to acquire the slightest taint, as it renders it unwholesome and offensive to the taste. The hind quarters are the choice and bring the most profit. The fillet, loin, leg, breast, shoulder, and best part of the neck are the best for roasts. The neck, breast, and knuckle are more usually stewed or boiled. The loin and ribs are cut into chops. The legs and ribs are made into cutlets. The lower part of the leg, or knuckle, is sold for soup pieces, stews, etc. A fillet of veal is the leg piece with the bone removed. The udder, or firm white of the fillet, is much used by French cooks instead of butter, especially in the composition of their force meats. The head and feet of the calf are valuable articles of food. The head should be sold with the hair taken off. The skin should have a healthy look and seem firmly attached; the eyes look bright and clear. If the head appears yellowish, it is inferior and will bring you a less price. In cleaning the head, be careful to remove the brains before scalding it. Calves' brains are a great delicacy and should bring you a good return. The feet are very rich in gelatinous substance. They should be scalded, scraped, and made to look clean and nice, when they are then ready for sale. Calves' haslet comprises the heart, liver, and lights. Calves' tongues are considered fine, and will sell well.

Sweetbreads are the glands (pancreatic) that assimilate the oily portions of the milk. Are located, one in the lower part of the throat and the other near the heart. The latter is the choicer, smaller and more nearly round. Sweetbreads are found in the young calf that is fed on the mother's milk until it has been turned out to grass, when they waste away, no longer being in use, or become tough, hard, and lose their delicacy. The two are usually sold together, and weigh perhaps half a pound. They are, without doubt, the greatest dainty that we have, though it is only in late years that they have been sold separate. Sweetbreads retail as high as one dollar each if of a good quality, and at one-fourth this price it will pay to sell them separately.

Veal Skins.—The time has arrived when it is only by taking off and caring for the skins well, that butchers can realise satisfactory prices. The best skins are so cheap that the medium and inferior skins are hardly worth the tanning. Drawn off or "fisted" skins will always remain the most valuable. A few hints in regard to taking off skins with the materials at hand in the ordinary slaughter house, adding perhaps, the bellows, are as follows:—

Sticking.—After knocking down the calf cut the jugular vein so that the animal will be well bled; this improves the meat, and also prevents a discolouration of the skin. The incision should be made lengthwise of the neck, as the cheek of the skin is of some value if not cut crosswise, otherwise it is only good for glue stock. After the calf has been strung up, stroke down the sides to prevent any blood from settling between the skin and the meat; it takes but a moment and will be noticed in the better appearance it presents, besides taking the salt better in curing.

Ripping.—Make the slit from the middle of the under jaw over the brisket down the centre of the belly between the teats, and even an inch or two down upon the roots of the tail. As to the legs, much of the shape of the hide depends upon the way they are ripped. A piece of calf skin is worth 70 cents per pound if choice, and averages perhaps three pounds. It is easy to decrease its value 10 cents per pound if the legs are not cut properly. The correct way is as follows:—Take hold of the fore leg with the left hand, cut around the leg just above the dew-claws, step back a step towards the tail to straighten the leg, drawing it a little away from the body, insert the knife at a point where the hoof is split on the front or forward side of the foot; now carefully run the knife directly over the knee so as to split it exactly in the centre, avoiding any side cuts or scallops; extend the slit to the top or centre of the brisket bone; serve the other fore leg in the same way. When this is done, grasp the hind foot in the left hand, cutting around the same as on the front foot; step back towards the head to straighten the leg, insert the knife at the back side of the leg between the dew-claws, run it down directly over the gambrel, then follow the line marked by the parting of the hair so that the slit runs where the hair parts, or more properly perhaps, where it meets. This line can usually be seen quite plainly; if this is followed the knife will strike the belly between the teats and the roots of the tail. Do the same with the other leg, and the skin will have a flat and even appearance when taken off. Now skin enough near the dew-claws to be able to take the skin in the hands, and pull off from the leg without further use of the knife. The butcher must be able to do his work quickly, as the skin comes off much harder after the calf is cold.

The Head.—Some butchers do not skin the head, thinking it does not pay, or that they will scald the entire head with the skin, and then scrape off the hair; but the skin on the head is worth taking off with the balance of the hide, if the throat is not cut crosswise. Skin the head in the ordinary way to a point about four to seven inches back of the ear. Of course, as much care is not necessary on the head, a few scores even are allowable on the best skins.

Skinning the Body.—The skinning of the body is the main feature of calf skinning, and butchers differ much upon this point. One way is, after the preliminary work is done and the calf strung up, commence upon the left side of the belly and skin with the knife enough to grasp the skin in the left hand, then commences the fisting off process. If it separates easily no instrument is necessary; if, however, it adheres too closely to the meat, take a piece of hard pine eight inches long and two inches wide, with rounded edges and shaped like an ordinary table knife, using it in place of a knife, making downward thrusts with the end of it as you would with a skinning knife. This will take perhaps a little longer and a little more muscle than with a knife, but the hide will be nicer and free from scores. Some butchers say after having skinned well down the centre of the back on one side of the calf, it is easy standing facing, to thrust the right fist entirely around the calf, and with one strong upward thrust entirely remove it from the hind quarters; but be sure and not use a knife in doing this. When loose from the hind quarters it is then easy to pull it from the fore quarters.

Second Method.—After skinning the head, hang up and make an incision in the belly about two inches long, take an ordinary steel and thrust it in between the skin and the meat, working it in all directions until the skin is separated within reach of the steel, then apply the lips, or an ordinary old-fashioned bellows, and fill the space with air, grasp the opening with the left hand and strike with the palm of the

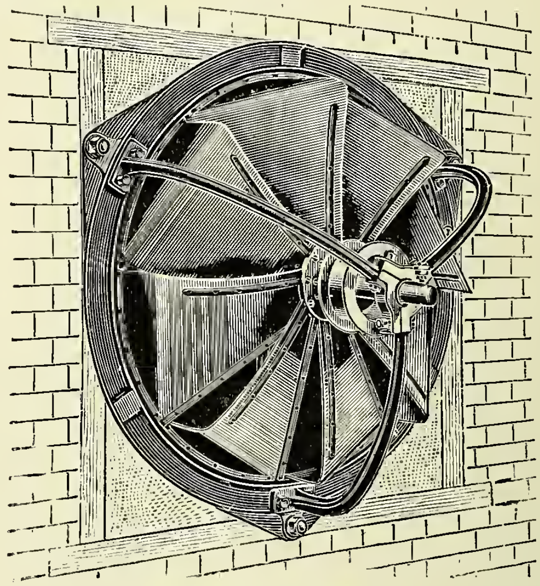
right a few blows upon the air confined inside. If this is done quickly while the calf is still warm, the skin will separate to a much greater extent than would be at first supposed. Now rip the legs and belly as in the first method and finish the same.

Curing.—Never put a skin in pickle; it causes it to plump nicely at first, but an old tanner can tell it immediately, as it soon falls away—that is, the plumpness disappears, and it can never be brought back again to its original fulness, but continues flat; and when made into leather is not as good in quality, and will not make as many pounds from the same number of pounds of stock. Do not allow the skin to drop down into the blood, but keep it clean and away from the sun. Do not allow it to touch iron, as rust is fatal to any calf skin; but place it flat upon the floor, sprinkle thoroughly with salt, being sure that every spot is covered; rub in thoroughly. Place the next one on top of this, and serve it in the same way. Do not pile more than one together until the animal heat has left the hide. Skins in summer time should never be left more than an hour before being salted. After the skins have lain in pack a week, they are ready to ship, and should be shipped as soon as enough are ready to make 200 or 300 pounds, for the fresher the skin the better the leather. Good choice skins will sometimes average as high as 95 cents per skin, though the commoner price is 70 cents. Do not allow skins to lie until they have a pinkish tinge, as they will then be of an inferior grade. They show they have lain in pack too long. In tying up, fold the edges in and leave the hair side out, putting about fifty pounds in each bundle, tying stoutly with good twine.

Veal Sausage.—Chop together 22 lbs. of good veal free from sinew and 11 lbs. of bacon, and make very fine. Season with 12½ oz. of salt, 1½ oz ground pepper, three nutmegs grated, and ½ oz. ground mace. Knead all together, and make into a paste with some milk. From a pint to a quart is required. Fill into narrow skins.

Venison.—Buck venison is considered finer than doe venison. The greater the depth of fat upon the haunch the better the quality of the meat, as venison cannot be too fat. If lean, it will be dry and flavourless. The fat should be clear and white, the lean of a dark red. If the cleft of the hoof be small and smooth, the animal is young; but if the marks are the reverse of these, it is old. The haunch is the prime and favourite joint of venison. The neck and shoulder are excellent for stews. If kept to the proper point and well dressed, this is the most tender of all meats. But care is necessary to bring it into a fitting state for the table without its becoming offensive. The fumes of creosote are said to be an admirable preservative against putrescence. The cuts are the loin, leg, saddle, fore-quarters, and steaks. Venison usually brings a good price per pound.

Ventilating Fans.—Very much more use is made of fans now-a-days as compared with former times when the only fan with which the public were at all familiar was the centrifugal or blast fan as used for ventilating mines, blowing Smith's fires, etc. That form of practice still remains in force, but the great increase alluded to is in the widely extended use of ventilating fans for moving air in quantity through rooms and buildings, and dates from the introduction into this country in 1883 of the Blackman fan or air propellor, as it was first called. Since then the makers of this fan alone, state that they have supplied about 60,000 fans, averaging a capacity of 10,000 cubic feet per minute, and therefore collectively capable of moving about a million tons of air per hour.



Blackman Type of Fan.

This type of fan having helical blades, and producing a large and slow current of air parallel to its axis, naturally handles much more air per horse power employed than does the older type, which is used for forcing a small quantity of air against considerable resistance.

In the frozen meat trade fans of the newer type are largely used for circulating the confined cold air over the meat and the chilling pipes so as to distribute the cooling effect evenly and to prevent any local increase of temperature. In the bacon trade these fans are widely employed, more especially for drying purposes and for the removal of smoke, steam, etc. In the purveying trades, to say nothing of restaurants, hotels, etc., the use of these "volume" fans (in many cases combined with electric motors) has introduced positive ventilation wherever any kind of motive power is available for driving. Those interested are slowly but surely learning that it is possible to procure really effective ventilation, and it is one of the many good things that cannot be had without some cost in mechanical appliance; but it is worth while to keep in mind that in buying a fan the money may be wasted unless competent advice is taken as to the application of it to the purpose proposed—whether it be for ordinary ventilation or for the removal of heat, fumes, smoke, or other vapours.

Vertical Boilers.—see Steam Boilers.

Vertical Fillers.—see Sausage Fillers.

Victoria (Australia).—Although the smallest of the five Colonies of the Continent of Australia, Victoria is one of the most prosperous. Full advantage has been taken of the rich pasture lands and mild climate. Australian butter, mutton, poultry, eggs, etc., are well known in the United Kingdom, and no expense has been spared to make the trade in these commodities a remunerative one to the Colony. The Government Handbook is filled with most

interesting and instructive information, and may be had from J. M. Sinclair, Esq., 153-155 Leadenhall Street, London, E.C. From this book we derive the following information :—

Dairy Farming.—Notwithstanding the exceptional natural advantages possessed by the Colony, the development of dairying was for a time beset with difficulties. Supplying the local markets was easy enough, but after that point was reached progress was suspended for many years. Making arrangements for placing a first-class article upon the British market presented many obstacles, and there is no saying how long the dairying industry would have languished had not an administrator come into power who knew what was required, and who had the courage to carry it out. The Hon. J. L. Dow, as Minister of Agriculture, commenced in 1888 a system of improving the dairying industry, which, in a few years, was abundantly justified by results. For three years bonuses were paid upon exports of butter, and by other means the modern factory system was brought into existence. A travelling dairy was employed in instructing the farmers; a model dairy was conducted at the Centennial Exhibition; Mr David Wilson, the Dairying Expert, was appointed; refrigerating cars were put upon the railway lines, cool stores were provided at country railway stations, refrigerating chambers were built in Melbourne, and a system of inspecting and branding approved butter for export was organised. Satisfactory results were immediately realised, and succeeding Ministers of Agriculture continued to encourage the new export trade—the present Minister, the Hon. J. W. Taverner, having been conspicuous in his efforts to extend and improve the rapidly-developing dairying industry.

Inspection of Dairies and Exports.—The Hon. J. W. Taverner's administration has been largely concerned in improving the cool storage arrangements in Melbourne, making better terms as to freights with steam-ship companies, and securing more effective inspection of exports, as well as providing for improved methods of examining herds and dairies in order to insure the soundness and wholesomeness of the produce. The exports of butter, which in 1890 amounted to only 400 tons, increased under the new system to 1,000 tons in 1891. In 1892 they were 2,140 tons, in 1893 3,611 tons, and they increased rapidly till 11,584 tons were reached in 1895, the value of butter and cheese exported in that year being over a million pounds sterling. Owing to an exceptional drought, there was a considerable falling-off in exports during 1896 and 1897; but the Dairy Expert has reported that reasonable precautions in the way of providing for the carrying forward of the surplus fodder of good years, to meet the needs of less favourable seasons, would easily enable the existing dairies to double the exports of 1895.

Pigs, Pork, and Bacon.—The keeping of pigs, while receiving some attention on many farms, has not been developed in the Colony to the extent which the prospects seem to warrant. The fact that an export trade has not yet been established upon a permanent basis may be taken as accounting for the slow progress of an industry calculated under the peculiarly favourable local conditions of yielding handsome profits. Excellent specimens of the best breeds were introduced in early times, and careful breeding has been carried out for many years, so that the stock of the Colony is generally of good quality. The Berkshire breed has met with the most favour, but recently Hampshires have been introduced, so that, with these and Yorkshires previously imported, the Berkshires are in some cases being crossed, in order to produce a type fulfilling the requirements of the modern market.

Favourable Local Conditions.—Cold weather is the condition which the fattener of pigs, as of other stock, finds it most difficult to cope with. Keeping up the heat of the animal body being an imperative first duty of food, a cold climate places a severe tax upon the fattening ration. In Victoria, the mild climate renders the work of the stock-feeder peculiarly profitable. Not only is the cost of expensive housing saved, but a large proportion of the food consumed is relieved from the duty of protecting against the cold and devoted to the making of flesh and fat. The pig-feeding experiments conducted at the Longerenong Agricultural College had the effect of demonstrating the favourableness of the climatic conditions under which pig-feeding is carried out in this Colony.

Feeding on Grain and Milk.—In 1895, when grain was abnormally cheap, the writer, then Principal of the Longerenong Agricultural College, in the Wimmera district, carried out a series of experiments to test the question as to the return obtainable from feeding pigs with wheat, oats, and a mixture of both these cereals, with and without skim milk. The experiments were commenced on the 14th June, and continued for ninety-two days, the pigs being weighed at the commencement and the conclusion. Nine thrifty young pigs were selected as nearly as possible of the same size and quality, and divided into three pens, each containing three pigs. Pen No. 1 was fed with wheat and separated milk; pen No. 2 with a half-and-half mixture of wheat and oats, along with separated milk; and pen No. 3 with wheat and water. The grain was crushed and soaked in water for twelve hours. In the case of pens 1 and 2 separated milk was given at the rate of two gallons per pig per day, and the same quantity of water in pen 3. Grain was fed at the rate of 6 lbs. per pig per day in two meals. The results were :—

Weight, 14th June.	After 92 days.	Gain.	Gain per day.	Gain per pig per day.
	lbs.	lbs.	lbs.	lbs.
Pen 1, 195 lbs. - -	608	413	4·489	1·496
Pen 2, 204 lbs. - -	595	391	4·25	1·416
Pen 3, 208 lbs. - -	552	344	3·739	1·246

Reckoning the live weight at 2d. per lb., the pigs in pen 1 returned a sum equal to 2s. 6d. per bushel for the wheat consumed. In pen 2 half the food was oats. Making an allowance of 10d. per bushel for the oats, the 825 lbs. of wheat returned 3s. 5½d. per bushel for the wheat consumed. The most striking features of the experiments are the profitable results of the wheat and oats mixture, and the beneficial effects of separated milk. The difference in the treatment of pens 1 and 3 was that one had separated milk and the other water, and the difference in the results were 69 lbs., or 23 lbs. per pig, a daily difference of ¼ lb. This gives a value of ¼d. per gallon to the separated milk. As the pigs fed with the milk were quite as fat, though lighter than those fed with water, the effect of the milk seemed to have been to produce a rapid growth. In pens 1 and 2 the difference in weight was only 22 lbs. Thus the selling price of the pigs would be only about 15d. per head less than if fed on all wheat, whilst the saving through the use of half oats

amounted to 5s. 9d. per head, or a clear gain of 4s. 6d. per head. In pen No. 1 the increase in live weight for the whole period amounted to 1½ lbs. per day per pig, and 4 lbs. of wheat made 1 lb. of live weight, or 15 lbs. of pork for each bushel of wheat. In estimating the value obtained for the grain used in feeding, it should be remembered that in the above calculations the gain or increased live weight had only been taken into account, whilst the feeding had also resulted in the whole animal becoming saleable at fat pig rates. Thus in pen 3 the 344 lbs. gain gives a return of 2s. 1d. per bushel for the wheat consumed, but the quantity of fat live weight for sale was 552 lbs. If the pigs had been sold in store condition the original 208 lbs. would not have fetched the same price as fat pigs. If ½d. per pound were allowed as the difference in value between fat and store pigs, there was a gain of 8s. 8d. on the pen, or 2s. 10⅓d. per pig from that source, making the return on the wheat about 2s. 5¾d. per bushel. I consider a good deal of the success is due to the mild climatic conditions of the country.

A Promising Industry.—Pig keeping in this Colony is one of the most profitable branches of agriculture, the genial climate being specially favourable, and it is likely that in the immediate future the industry will be largely extended. Like all departments of production confined to supplying local markets, the raising of swine has been seriously kept back by the periodical occurrence of over-production and low prices. The attention which is now being paid, however, to opening up markets for more or less perishable products in London and elsewhere is likely to result in an outlet being found for the surplus of pork, bacon, and hams, so that an industry which is so profitable to such countries as America and Denmark will probably show a rate of expansion akin to that of the butter trade.

Poultry and Eggs.—The keeping of poultry, like several other minor branches of rural industry, is at the present time undergoing a change, which is likely to result in a great expansion of the business. Until recently, local markets were relied upon, and these frequently became over-supplied, with the result that prices for both eggs and table birds fell to very discouraging rates. Under such circumstances poultry-keeping was kept within defined limits, and progress was impracticable. The opening up of an export trade, however, has entirely changed the prospects of this industry, and it is almost certain that the progressive movement which has now been commenced will be continuous. Local conditions, and especially the exceptionally favourable climate, have long been recognised as offering special advantages to poultry-keeping, but continuous progress could not be expected until an outlet for the produce had been assured.

Special Advantages.—The wonderfully mild climate of Victoria, with absence of cold winters, is exceptionally favourable to poultry-keeping, as it is to so many other rural pursuits. Very few native-born Victorians have ever seen snow, and it is rare to find ice as thick as a penny on shallow pools in the coldest parts of the Colony. Under these conditions poultry thrive, with the minimum of food and attention, and there is another natural condition which is of immense importance, viz., the geographical position of the Colony. Situated at the Antipodes, the time of the various seasons is opposite to that of the Northern Hemisphere. When England, Russia, Belgium, France, as well as Canada and the United States, are enduring the severity of the northern winter, Victoria is enjoying the warm summer. It would seem as if the Colonies at the Antipodes had been intended by Nature to compensate northern countries for the losses of the rigorous winter. However this may be, it is certain that a beginning has been made by this Colony in a system under which the cheaply produced abundance of our spring and summer months will find a profitable market during the winter scarcity of the Northern Hemisphere. Our exports of eggs and poultry have not yet reached any considerable dimension, for the practicability of exporting has too recently been demonstrated, but the market having been found remunerative, and the transport practicable, the expansion of this business has been fully assured.

The Butter Factories.—Butter factories have now been established in all parts of the Colony, from the cool coast districts to the drier and warmer inland and the far north-western "mallee." So effective is the factory system, with its modern methods of securing by artificial means the required conditions of success, that butter of the finest quality has been produced in the driest and hottest districts of the Colony, even within the boundaries of the "mallee" division. The returns for 1895 show a total of 174 butter factories, and it is to be noted that, while these represent all portions of the Colony, they are as yet spread only sparsely over the various districts. While progress has been satisfactory, the scope for development is so large that many years will elapse before the limits of the industry's profitable expansion will be reached. The factories are carried on upon the co-operative principle, the most of the shareholders being milk suppliers, who receive for their milk prices fixed from time to time by the directors, according to the butter market, and also their proportion of the profits made by the factory company. The milk supplied is tested and paid for according to its proportion of butter fat. The prices paid for the milk have generally been satisfactory, and, as a rule, dividends have also been paid by the companies.

The Cheese Factories. — The cheese making industry became prominent in the Colony before the butter factories came into existence. Until it became possible to place first-class butter on the British market, dairying was practically restricted to supplying the limited local demands. As cheese could be exported, the production of that commodity received a good deal of attention, and the industry would no doubt have continued to make progress had not a more profitable one become available to the dairy farmer. The high price of butter, however, as compared with the price of cheese, has, so far, prevented any recent development in the production of the latter. There are at present twenty butter factories which also make cheese, and seventeen cheese factories. The development of cheese making would rapidly take place if a serious drop occurred in the value of butter. The dairying industry has thus two strings to its bow. Cheese making has paid well, and would pay now; but, for the present, butter making pays better.

Veterinary Inspection.—Mr David Wilson, the Government Dairy Expert, says—"Another effort has been recently made in England to raise a scare against Australian perishable produce. This time it is against our mutton. The charges, however, will be as easily disproved as were the charges of adulteration made about our butter. A committee of the House of Commons recommended that all our beef and mutton for export, and all dairy herds, should undergo veterinary inspection. It cannot be made too widely known that many of our butter factories have had this system in operation for over twelve months, and that a

veterinary surgeon's certificate as to the health of the cows from which the milk was produced accompanies every box of butter these factories export. No doubt all the factories will gradually adopt a similar system, even although their milk suppliers' herds may be in perfect health. As for the beef, mutton, rabbits, hares, and poultry that Victoria exports, I am pleased to be able to report that a system of veterinary inspection has been rigidly carried out during the past two shipping seasons, a veterinary certificate accompanying every carcase of mutton and beef, and every package of poultry, hares, and rabbits, certifying that same has been inspected, and is fit for human consumption. To a very large extent, therefore, we have anticipated the recommendation of the committee of the House of Commons."

Exports of Perishable Products.—The modern system of preserving fresh perishable produce by means of cool storage has raised Victorian agriculture, and set it upon a new plane of prosperous development. Our limited population provided only a restricted local market, and our distance from the world's great centres of consumption confined agricultural development to the production of such staple commodities as grain and wool that were suitable for exportation. All the valuable perishable products of agriculture had to be kept strictly within the narrow limits of local consumption. The introduction of the cool storage system has produced a revolution. Artificially cooled stores, refrigerated railway trucks, cold storage depôts at the ports, and refrigerating chambers in ocean steamships, have opened up the markets of the world to the most perishable products of farms, dairies, orchards, and vineyards. A beginning only has been made in exploiting this new field of agricultural wealth. Dairying has certainly, with wonderful rapidity, demonstrated the potency of the change, but the various other branches of agriculture are only taking the first steps in this new career of prosperity.

Exports for 1897.—The exports for the year ending April, 1897, through the depôt of, and under the inspection of, the Department of Agriculture, give an indication of the variety of products which the Colony is now beginning to place upon the British markets:—

PRODUCE.	QUANTITY.	ESTIMATED VALUE.		
		£	s.	d.
Butter (tons)	9,895½	942,247	3	4
Mutton and Lamb (carcases)	79,062	39,531	0	0
Rabbits (pairs)	932,203	77,683	11	8
Hares (,,)	5,533	1,383	5	0
Game (,,)	316½	31	13	0
Turkeys (,,)	664½	664	10	0
Ducks, Fowls, and Geese (pairs)	10,219	3,832	2	6
Eggs (dozens)	12,338	616	18	0
Milk (tons)	11	123	4	0
Mutton (legs)	12,338	1,233	16	0
,, (haunches)	58	11	12	0
Beef (quarters)	400	1,000	0	0
Pork (carcases)	434	868	0	0
Kidneys (crates)	54	54	0	0
Veal, Sausages, Ox Tails, Tongues, and Sundries (packages)	165	200	0	0
Totals	...	1,069,480	15	6

In the above the exports of some private companies who ship beef and mutton from other ports, such as Geelong and Portland, are not taken into account. So far, the exports of chilled meat from these ports have not reached large dimensions, but they may be expected to increase considerably in future years.

Vienna Sausages.—

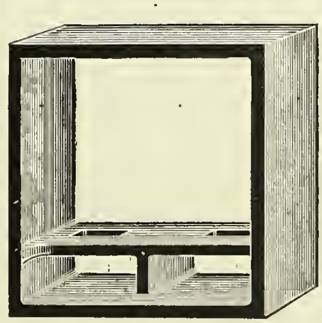
10 lbs. lean veal from neck or leg,

10 ,, streaked pork from a young animal.

If preferred, 15 lbs. of one kind of meat and 5 lbs. of the other may be taken, of whichever is the cheaper for the time being. Two-thirds veal and one-third pork are very good, as they make the sausage such a nice colour. Before chopping the meat, both pork and veal should be treated thus: One or two days before, if possible, it should be cut into pieces like beans, and then salted in the usual way with 1 lb. salt, ½ oz. saltpetre, 1 oz. white Indian cane sugar. Be sure that the brine is well rubbed in to all the meat, and that the meat is afterwards pressed very closely and kept from air. In this way the sausages will be of a lasting colour, and will keep for more than a week.

Now chop the veal first, then add the pork: it should not be so fine as the veal. To 20 lbs. of meat take 1¼ oz. of white pepper, ½ oz. finely ground corianders, one stick garlic and two eschalots, grated. Mix all well together and add to the meat. Now add 2 to 3 lbs. newly killed meat, then begin to stir round and round for half-an-hour, adding a little water occasionally: in winter the water should have the chill off it. Fill into not too narrow sheepskins, hang them on sticks for some hours to get dried; in winter in a warmed room. When smoking, be careful not to let the skin get hard. The sawdust for smoking must be in a perfect glow when the sausages are hung up, and the room about 133° Fahr. They should hang twenty to twenty-five minutes, and be of a chestnut-brown colour. Immediately on being smoked, they should be put into hot water and stirred round about on the stove. When they rise to the top of the water, they are ready and should be taken out and hung on white sticks. These sausages have been famous in Vienna since 1857. (See also Frankfort Sausage)

Vienna Sausages.—see Bacon Curing in Denmark.



Wall Box.

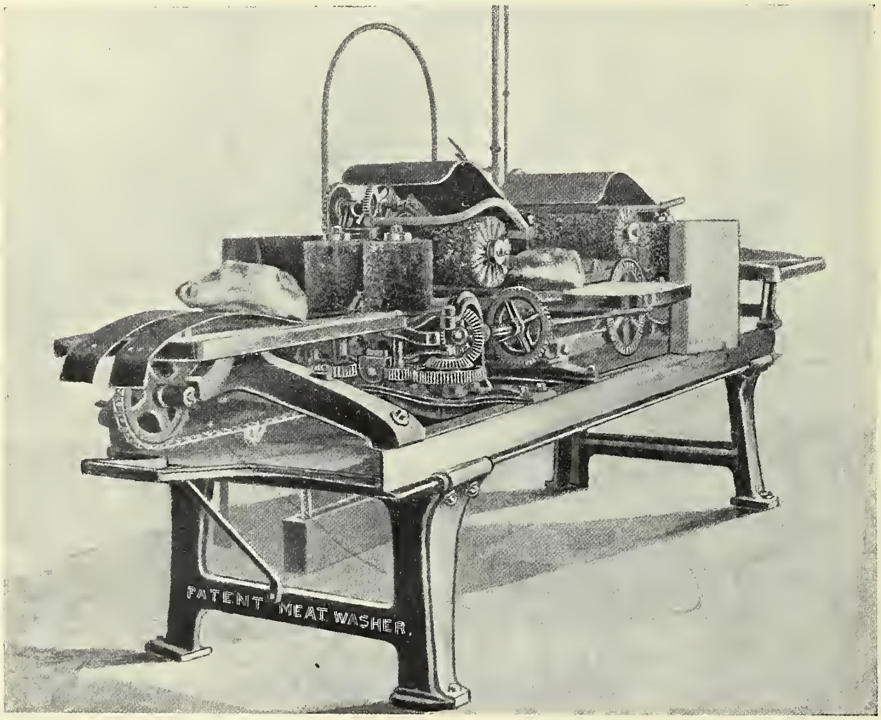
Wall Box.—A cast iron frame for building into a wall into which a plummer block is fixed for carrying the end of a line of shafting. The wall box being built in solid gives rigidity to the shafting and prevents vibration.

Wall Hoist. — see Hoists.

WASHING Bacon.—The bacon and hams which come into the United Kingdom from the United States and other countries, amounting in value to about £20,000,000 worth per annum, would seem to warrant the use of some sort of mechanical appliance for the washing and cleansing process. At present the washing is performed by hand, and is very slow indeed. Each piece of meat is handled in a washing trough and brushed until the slime, borax, and salt are removed. This occupies a great deal of time. Some

provision merchants have adopted a system of circulating the water from the washing trough round by means of a pump. The water is drawn from the bottom of the trough and elevated over it again, being discharged with great force over the meat. By this means much brushing and rubbing is avoided. But the whole process can be more expeditiously performed by means of such a machine as is illustrated.

The meat is carried through the machine by means of an endless chain the while it is rubbed by the brushes on top,



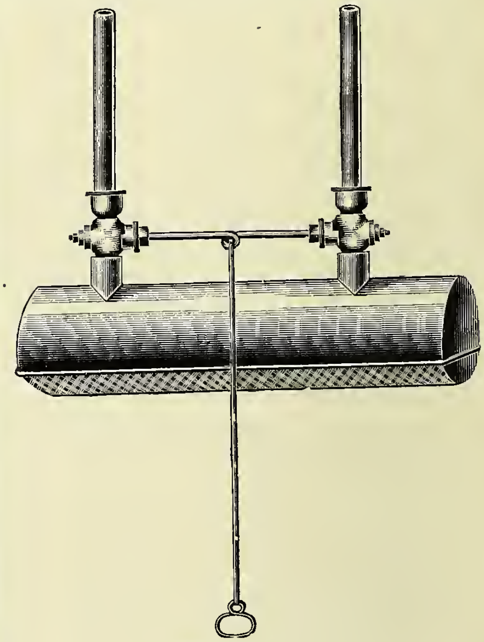
Meat Washing Machine.

bottom, and sides. A heavy douche of water is discharged over it as it passes through, and hence all the objectionable slime and other matter is removed. Many thousands of pieces can be passed through in an hours' time.

Washing Soda.—Used principally as a detergent, is manufactured chiefly from common salt. In the old Leblanc process the salt was first roasted with sulphuric acid in reverberatory furnaces when "salt cake" or sulphate of soda was left in the furnace and hydrochloric acid was driven off in the form of vapour. The salt cake was then mixed with certain properties of coal and chalk and roasted in other furnaces, and a solid residue of carbonate of soda and sulphide of lime remained and carbonic acid disappeared as gas. The above residue was then dissolved in lukewarm water in tanks when the carbonate of soda went into solution and the sulphide of lime remained insoluble. The solution boiled down yielded the soda ash of commerce. This soda ash, dissolved in boiling water until saturated and then run into crystalising vats, yielded washing soda crystals on cooling. The molten liquor was then drained off and the crystals allowed to dry, when they were packed into casks for the market.

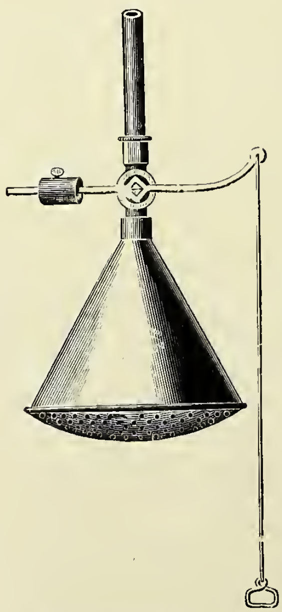
The above process has now been largely superceded by simpler processes—more particularly the ammonia soda process, in which bi-carbonate of soda is formed direct from common salt solution by saturating it with ammonia and carbonic acid gases. The bi-carbonate on being heated becomes carbonate, which can be crystallised as above. On being heated washing soda loses about half its weight, the other half being water of crystallisation.

Water Sprinklers.—When pigs have been singed they are thrown down on to a low table where the "gob-hook"



Double Water Sprinkler.

is removed, the sinews in the hind legs exposed, and bar-hooks inserted behind them. The pigs are then suspended from the bars head downwards and cold water run on the carcases while they are scraped with a flat scraper. The water is for cooling and washing purposes combined.



Single Water Sprinkler.

Weasand. — The pipe by which the air is conveyed to an animals' lungs. It is used as the cover or skin for various kinds of sausages, such as German, poloney, ham, tongue, and chicken, etc. When the weasand is taken from the animal it is hung up, and has the appearance of a fleshy strip. The cleaner then takes his knife and strips off the fleshy covering or weasand meat as it is called; turns the skin outside in, and inflates same. Weasands are usually sold in wind, although for the convenience of transit it is usual to let the wind out

before despatching by rail. The technical description of weasands, so far as length is concerned, is "two string" or "three-string" as the case may be; the former

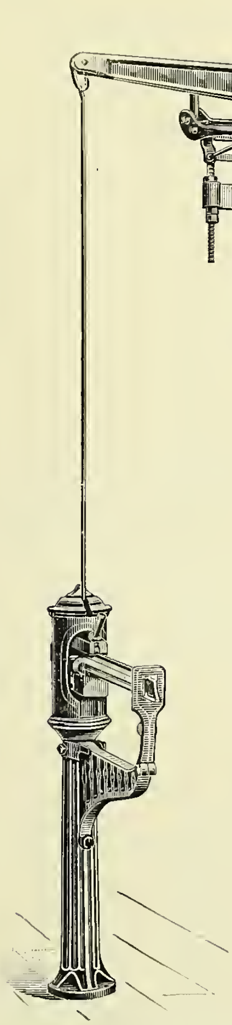


Fig. I. Slaughter-House Weighing Machine.

means a short weasand which only requires two strings to tie the bundle, while the latter, owing to being much longer, requires three strings to tie the bundle. A "two-string" weasand will fill out from two to three pounds of meat, and a "three-string" will fill out from three to five pounds meat, depending on the diameter of the skin.

Weidner Fat Slicer.—see Fat Cutter for Cutting Thin Slices of Fat.

Weighing Machines.—Weighing machines are a necessity to every trader, whether for buying or selling. "Caveat emptor" is not relied on as it used to be, as the buyer's eye in modern times very often makes a bad merchant. By Act of Parliament it is now compulsory to erect cattle weighing machines at all places where tolls are exacted on the sale of live stock. By the use of the weigh-bridge the farmer gets full value for his animal, and the butcher also receives value for his money. Experience soon proves what allowance should be made on the gross weight of the live animal to enable the butcher to dispose of the dead carcase at a profit. The usual type of cattle weighing machine is an ordinary weigh-bridge, and having a substantial fence affixed to keep the animal in position. The illustration (Fig. II.) is an improved machine, having a high frame work, carrying pulleys, chains, and weights for raising and lowering the gate.

Another valuable weighing machine is one for weighing carcases of animals without removing the carcase from the rail in slaughter-house (Fig. I.) The suspensory part of this machine has attached to it a bar of the same section as the tracking, and the carcases are run along on to this bar, and the weight is taken at the pillar and lever on the floor. It will be obvious, on studying the illustration, that the

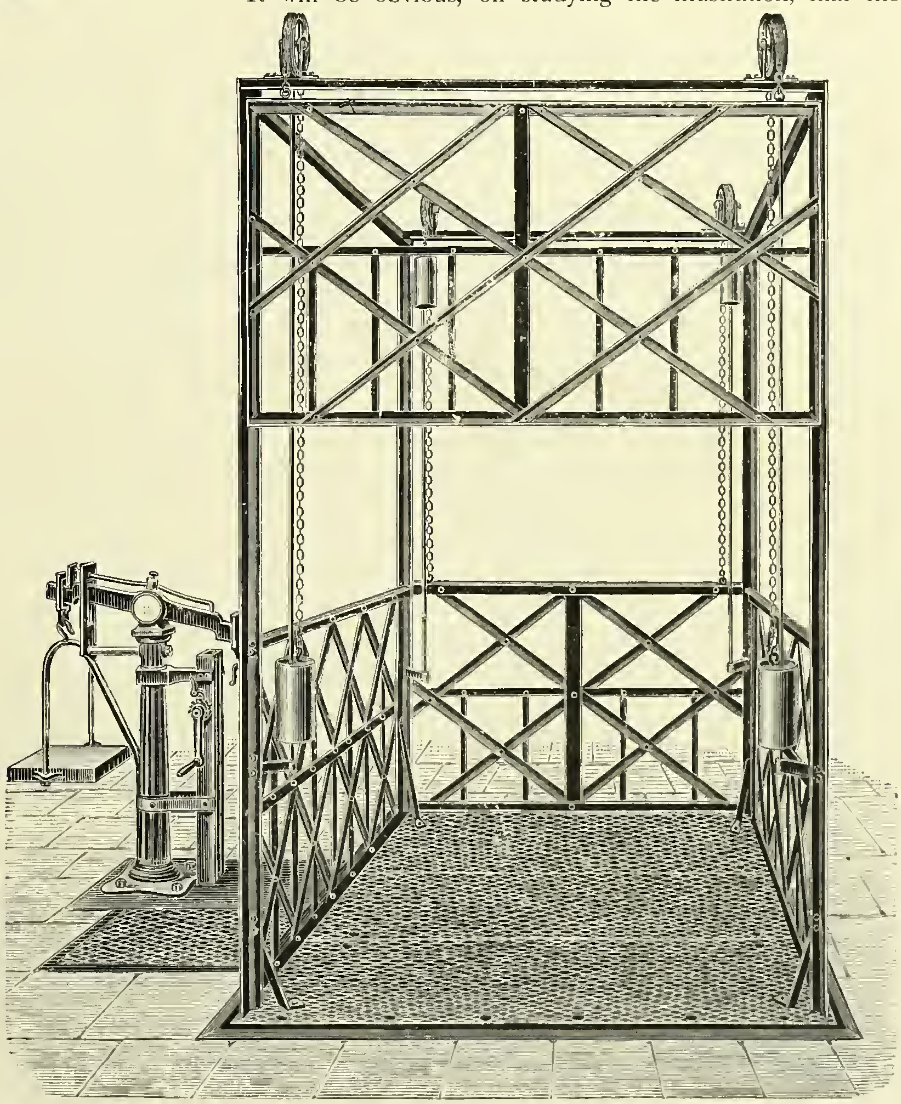


Fig. II. Cattle Weighing Machine.

weighing can be done about as fast as the men can push the carcases on and off the bar.

Another system of track weighing machine is what is used in first-class bacon factories (Fig. III.). It is constructed

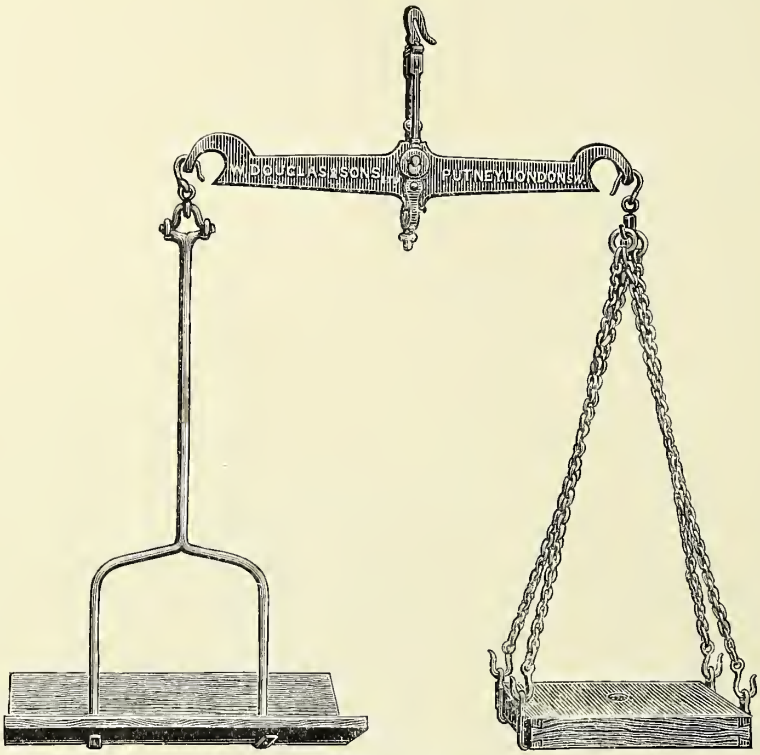


Fig. IV. Bacon Scale.

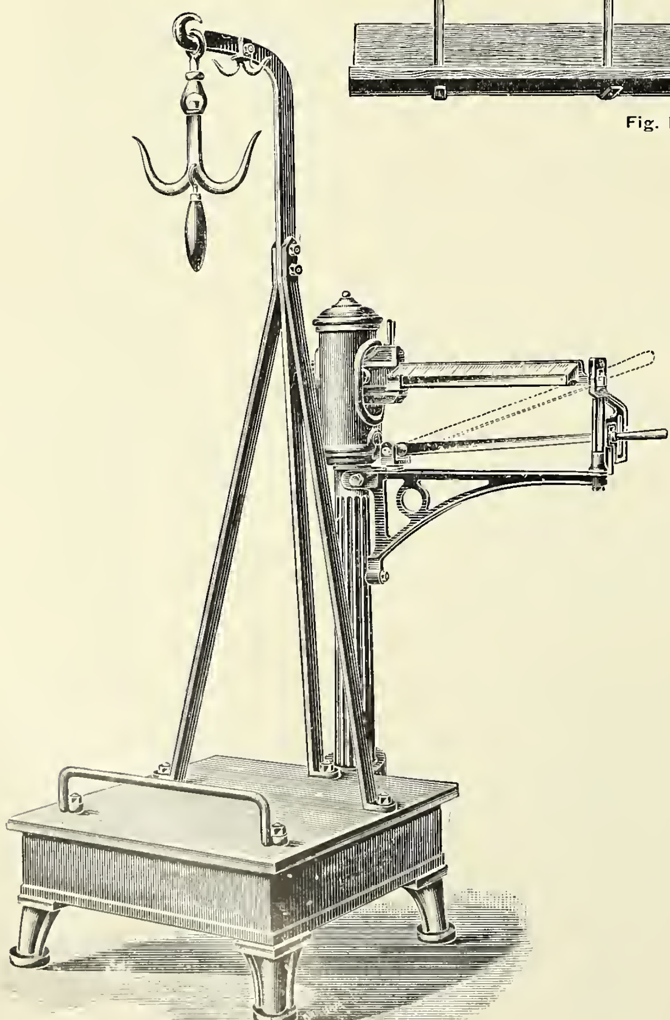


Fig. V. Meat Market Weighing Machine.

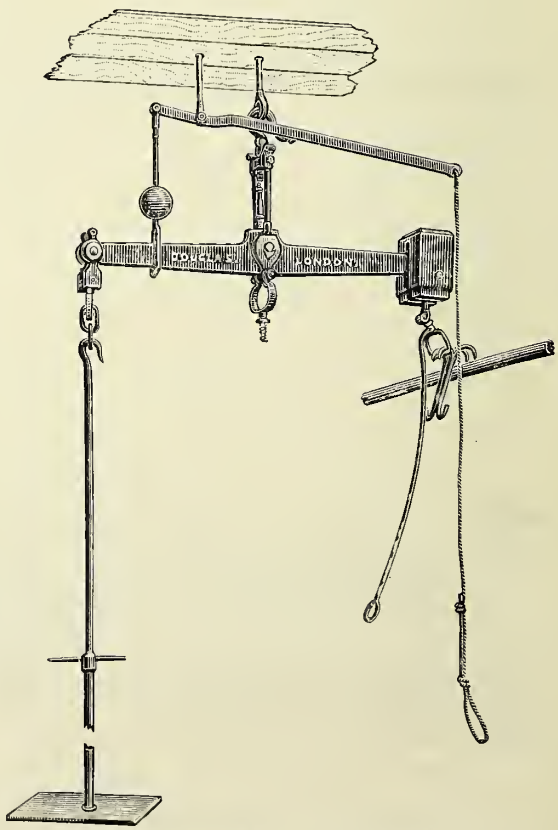


Fig. III. Pig Weighing Scale for Bacon Factories.

on the beam and scale principle, is very strong, simple, and stands a large amount of tear and wear. Its use saves the disputes that, at one time, were so common with farmers, who objected to have their pigs weighed on a lever machine. The heavy weights are put on the lower platform, and the small weights on the small platform higher up, which obviates the necessity for stooping on the part of the weighing clerk. The operations of lifting, weighing, and returning the carcase to the track bar are extremely simple, and a large number of carcases can be weighed in a short space of time.

In packing and weighing out bacon a special scale is used, which enables the weighers to load up one side, while the other is being unloaded. It is essential that in large factories the operation of weighing should be done expeditiously, and this type (Fig. IV.) has been found the most useful scale for the purpose.

A rather different type of machine is the meat market weighing machine (Fig. V.) The quarters of beef and carcases of mutton are hung on hooks, which work on a swivel. These hooks are supported on strong, iron bars, stayed and bolted to the platform of machine. Suspended under the hooks is a wooden handle by which the men steady themselves when hooking or unhooking the meat This class of weighing machine is largely used in the London Smithfield markets.

The steelyard is still used a good deal; and a very good style of this class of machine is that which prevents the ball running down and destroying the notches when the load is suddenly removed (see Fig. VI.). By a special arrangement, a brake operates when the steelyard gets into an inclined position, and the ball is

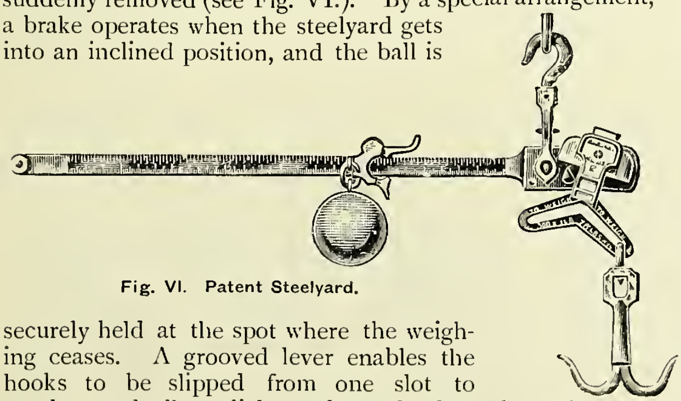


Fig. VI. Patent Steelyard.

securely held at the spot where the weighing ceases. A grooved lever enables the hooks to be slipped from one slot to another, and allows light or heavy loads to be weighed at pleasure—the registering markings being all on the one side. Machines of this type have the notches cut by machinery, and, like the machine-made Geneva watches, are thoroughly reliable.

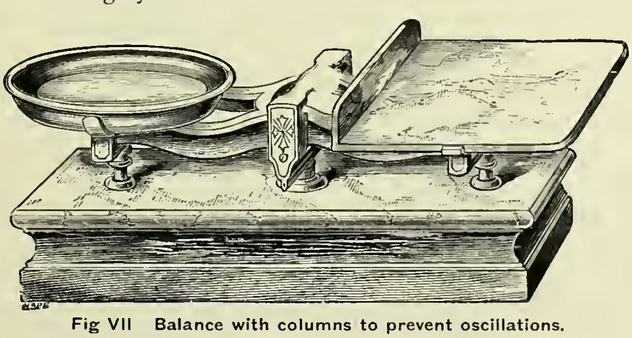


Fig VII Balance with columns to prevent oscillations.

For the shop counter a great variety of balances and scales are sold, but the leading types are the balance with supporting columns (see Fig. VII.) to prevent oscillations, and the ordinary counter scale (Fig. VIII., page 388).

The counter scale may be finished in almost any style, and, indeed, often is a most ornate and picturesque apparatus, but to give a fair idea of the class, Fig. VIII. may be taken as a good example.

There are, of course, endless varieties and styles, but the examples illustrated are sufficient to serve our purpose in the scope of this article.

One remaining type of weighing machine, viz. the spring balance, deserves notice. A spring is specially tempered to the required strain, and enclosed in an iron box behind the dial face. To this spring is attached the beam and hook. The weighting or pulling of the hook causes the spring to operate the needle in front of the dial, which registers according to the markings on the circle the weight or degree of strength used to pull the hook from its normal position.

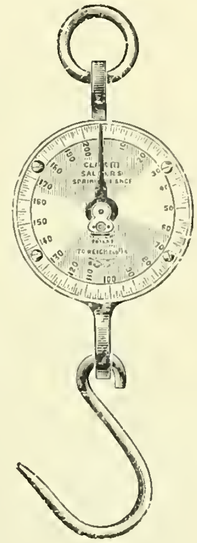


Fig. IX. Spring Balance.

The Weights and Measures Act of 1878 and the Amending Act of 1889 makes it compulsory to have proper weighing machines duly stamped under a penalty of fine or imprisonment and confiscation of the machine: imperial weights being the recognised standard.

Section 19 of the Act of 1878 enacts that—

"Every contract, bargain, sale, or dealing made or had in the United Kingdom for any work, goods, wares, or merchandise, or other thing, which has been or is to be done, sold, delivered, carried, or agreed for by weight or measure, shall be deemed to be made and had according to one of the imperial weights or measures ascertained by this Act, or to some multiple or part thereof, and if not so made or had shall be void; and all tolls and duties charged or collected according to weight or measure shall be charged and collected according to one of the imperial weights or measures ascertained by this Act, or to some multiple or part thereof.

Such contract, bargain, sale, dealing, and collection of tolls and duties, as in this section mentioned, is in this Act referred to under the term "trade."

No local or customary measures, nor the use of the heaped measure, shall be lawful.

Any person who sells by any denomination of weight or measure other than by one of the imperial weights or measures, or some multiple or part thereof, shall be liable to a fine not exceeding forty shillings for every such sale."

Sections 25 and 26 further enact that—

"25. Every person who uses or has in his possession for use for trade any weight, measure, scale, balance, steelyard, or weighing machine which is false or unjust, shall be liable to a fine not exceeding five pounds, or in the case of a second offence ten pounds, and any contract, bargain, sale, or dealing made by the same shall be void, and the weight, measure, scale, balance, or steelyard shall be liable to be forfeited.

26. Where any fraud is wilfully committed in the using of any weight, measure, scale, balance, steelyard, or weighing machine, the person committing such fraud, and every person party to the fraud, shall be liable to a fine not exceeding five pounds, or in the case of a second offence ten pounds, and the weight, measure, scale, balance, or steelyard shall be liable to be forfeited."

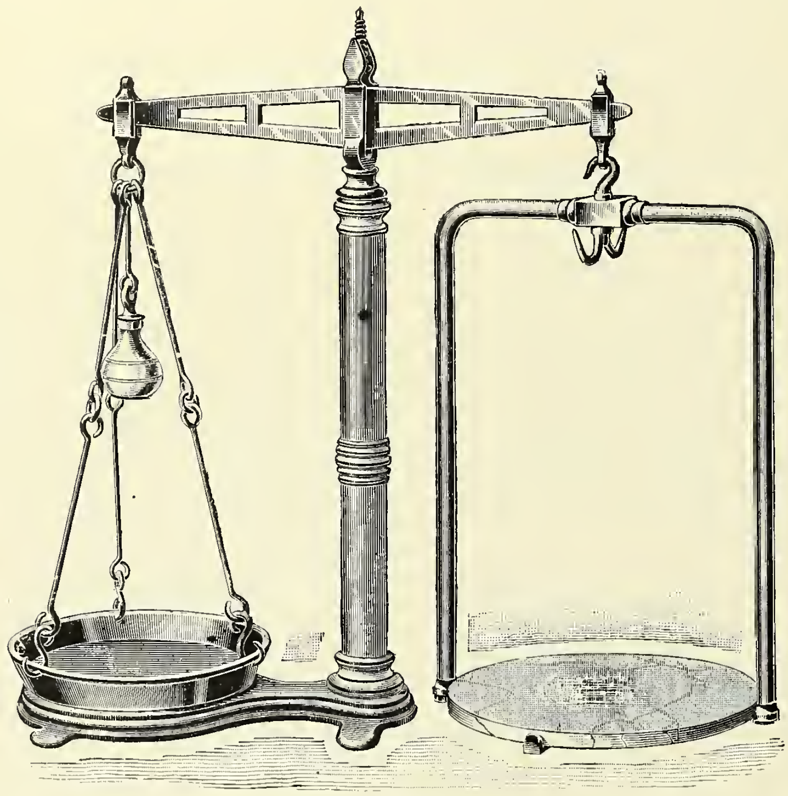


Fig. VIII. Counter Scale.

The following sections of the Amending Act of 1889 are worthy of close perusal:—

" 1. Every weighing instrument used for trade shall be verified and stamped by an inspector of weights and measures with a stamp of verification under this Act.

3. The fine for a second or a subsequent offence under section twenty-five or section twenty-six of the principal Act shall be a sum not exceeding twenty pounds, and the provisions of the said section twenty-six with respect to the forfeiture shall apply to weighing instruments in like manner as they apply to weights, measures, scales, balances, and steelyards.

4. Where a person is convicted under any section of the principal Act, or this Act, of a second or subsequent offence, and the court by which he is convicted is of opinion that such offence was committed with intent to defraud, he shall be liable, in addition to, or in lieu of, any fine, to be imprisoned with or without hard labour for a term not exceeding two months.

Inspectors are empowered to charge the following fees for verifying and stamping weights and weighing machines:—

Weights.

Avoirdupois:	*s.*	*d.*
Each weight of 100 lbs. (central)	0	4
,, ,, ,, 56 lbs. and 28 lbs.	0	3
,, ,, ,, 14 lbs. and 7 lbs.	0	2
,, ,, from 4 lbs. to 1 lb., inclusive	0	1
,, ,, ,, 8 oz. to ½ dram., inclusive	0	0½

Weighing Instruments.

For 10 tons and above	10	0
For under 10 tons and above 1 ton	5	0
For 1 ton and above 5 cwt.	2	0
For 5 cwt. and above 1 cwt.	1	6
For 1 cwt. and above 56 lbs. (exclusive of cost of cartage and lifting of standards in each of the above cases).	1	0
For 56 lbs. and above 14 lbs.	0	6
For 14 lbs. and above 1 lb.	0	3
For 1 lb. or under	0	2

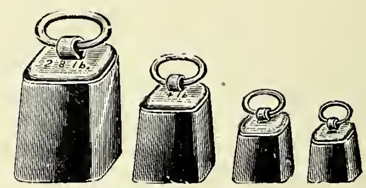


Fig. I. Ring Weights.

Weights.—The standards for ascertaining the weights of other bodies. These are usually made of iron or brass, and, according to the Weights and Measures Act, must be stamped. (See Fees for Stamping, under Weighing Machines). There are no compulsory designs for weights, but the recognised patterns are as follows:—

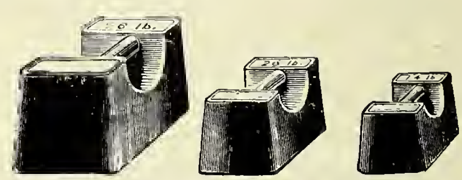


Fig. II. Bar Weights.

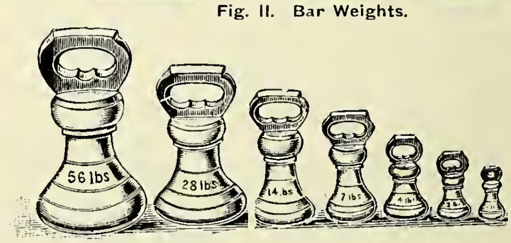


Fig. III. Bell Shaped Weights

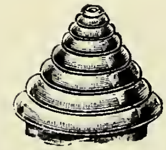


Fig. IV. Flat Weights.

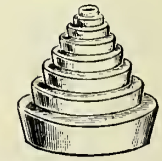


Fig. V. Bevelled Edge Flat Weights.

The bar and ring weights are always made in iron, while the bell, flat, and bevelled edge patterns are made in either iron or brass. For counter purposes the brass weights are preferable, as they can be so easily kept clean, and, with a neat balance or scale, form an attractive part of the counter.

Weights and Measures.—

Imperial Troy Weight.

·003961 cubic inches of water	= 1 grain (gr.)
24 grains	= 1 pennyweight (dwt.)
20 pennyweights	= 1 ounce (oz.)
12 ounces	= 1 pound (lb.)
	5760 grains.

Imperial Avoirdupois Weight.

16 drachms (dr.)	= 1 ounce (oz.)
16 ounces	= 1 pound (lb.)
14 pounds	= 1 stone (st.)
28 pounds	= 1 quarter (qr.)
4 quarters	= 1 hundredweight (cwt.)
20 hundredweight	= 1 ton.
1 pound	= 7000 grains.

Weights of Stones.

Imperial	14 lbs.	Smithfield	8 lbs.
Dutch or Troyes	$17\frac{1}{2}$,,	The score	20 ,,
Edinburgh (Trone)	22 ,,	The central	100 ,,
Glasgow (Trone)	$22\frac{1}{2}$,,	The cwt.	112 ,,
Ayrshire (Trone)	24 ,,		

Imperial Measures of Capacity.

5 ozs. of water	= 1 gill.	2 gals.	= 1 peck (pk.)
4 gills	= 1 pint (pt.)	4 pecks	= 1 bushel (bus.)
2 pints	= 1 quart (qt.)	8 bushels	= 1 quarter (qr.)
4 quarts	= 1 gallon (gal.)		

These measures are used up to the gallon for liquids, and from the peck upwards for dry goods.

Apothecaries' Weight.

20 grains	= 1 scruple (sc. or ℈).
3 scruples	= 1 drachm (dr. or ʒ).
8 drachms	= 1 ounce (oz. or ℥).
12 ounces	= 1 pound (lb.)

Bread and Flour Weight.

4 lbs. $5\frac{1}{2}$ oz. Imp.	= 1 qr. loaf.
8 ,, 11 ,,	= 1 half-peck loaf.
17 ,, 6 ,, Imp.	= 1 peck loaf.

A peck or stone of flour is 14 lbs., a bushel of flour is 56 lbs., a boll is 140 lbs., and a sack or 5 bushels is 280 lbs., or $2\frac{1}{2}$ cwts.

Corn Measures

2 quarts	= 1 pottle.	4 bushels	= 1 sack.
2 pottles	= 1 gallon.	2 coombs or 8 bushels	= 1 quarter.
2 gallons	= 1 peck.	4 quarters	= 1 chaldron.
4 pecks	= 1 bushel.	5 quarters	= 1 load.
2 bushels	= 1 strike.	2 loads or 10 quarters	= 1 last.
4 bushels	= 1 coomb.		

The gallon has the same cubic capacity in all imperial measures, *i.e.*, $277\frac{1}{4}$ cubic inches or = 10 lbs. of distilled water at 62° F. and barometer at 30 inches. The bushel is 1·28 cubic feet: $19\frac{1}{2}$ inches diameter and $18\frac{1}{4}$ inches deep.

Wool Weight.

7 lbs. Avoirdupois	= 1 clove.
14 ,, or 2 cloves	= 1 stone.
28 ,, or 2 stones	= 1 tod.
182 ,, or $6\frac{1}{2}$ tods	= 1 wey.
364 ,, or 2 weys	= 1 sack.
4368 ,, or 12 sacks	= 1 last.
20 ,, = 1 score and 240 lbs., or 12 scores	= 1 pack.

In practice wool buyers frequently reckon 30 lbs. to the tod.

Acres.

Imperial Acre = 4,840 sq. yds. = 43,560 sq. ft. = 6,272,640 sq. in.

		sq. yds.	imp. ac. = 1
Scotch	standard acre	6104·128	1·26118
Cunningham	do.	6250·0	1·291
Dumbarton	do.	6084·444	1·257
Inverness	do.	6150·4	1·270
Irish Plantation	do.	7840·0	1·61983
Northumberland and Durham	do.	5926·58	1·2245
Westmorland	do.	6760·0	1·396
West Derby	do.	9000·0	1·859
Lancashire	do.	7865·968	1·6252
Cheshire	do.	10240·0	2·1157
Leicestershire	do.	2308·75	0·477
Herefordshire	do.	3226·66	0·666
Wiltshire	do.	3630·0	0·750
Devonshire	do.	4000·0	0·826
Cornish	do.	3760·084	1·1901
North Wales (customary)	do.	3240·0	0·669
Do. (erw)	do.	4320·0	0·892
French and Belgian "Hectare"		11960·46	2·4711
Prussian "Morgen"		3053·0	0·630
Rhine do.		10185.0	2·1043
Hamburg do.		11505·0	2·3770
Amsterdam do.		9722·0	2·0086
French "Are"		119.6046	0·020016

Solid Measure.

1728 cubic in.	= 1 cubic foot (cub. ft.)
27 cubic ft.	= 1 ,, yard (cub. yd.)
A barrel bulk	= 5 ,, feet.
A load of rough timber	= 40 ,, ,,
A load of squared timber	= 50 ,, ,,
A ton of shipping	= 42 ,, ,,

To ascertain the Weight of Cattle by Measurement.—Take the measurement of the girth where it is smallest (close behind the shoulder), and the length of the animal from the front of the shoulder to the juncture of the tail. Multiply the square of the girth in feet and inches by the length in feet, and multiply the product by ·23, ·24, ·26, ·28, or ·30, according to the fatness of the animal, and the result will give the weight in imperial stones. For instance, if the girth of an animal in moderate condition be 6 ft., the length as above 5 ft. 4 ins., then $6 \times 6 = 36 \times 5\frac{1}{3} = 192 \times {\cdot}24 = 46{\cdot}08$ stones. The above is the carcase weight of the animal. The weight of the carcase would be about $\frac{5}{8}$ths of the live weight for cattle; for sheep, from $\frac{1}{2}$ to $\frac{5}{8}$ths; and for a pig, from $\frac{1}{2}$ to $\frac{3}{4}$ths of the live weight.

Metric Weights and Measures.—The metric system is generally employed in Austria-Hungary, Belgium, France, Germany, Holland, Italy, Portugal, Spain, and Switzerland, and to a greater or less extent in many of the South American States, and in Sweden and Norway.

This system was based on a measurement of the distance of a meridian from the pole to the equator, and the first measure deduced was the metre, which is the one ten-millionth part of that distance. The Greek prefixes *deca* (10), *hecto* (100), *kilo* (1000), and *myria* (10,000), are employed to signify multiplication; and the Latin prefixes *deci* ($\frac{1}{10}$), *centi* ($\frac{1}{100}$), and *milli* ($\frac{1}{1000}$), signify division.

Weights.

The gramme is the weight of a cubic centimetre of water at 4° C. It is equal to 15·432 grains. 1 lb. English = 453·592 grammes. 1 cwt. English = 50·802 kilogrammes.

The divisions of the gramme are: The milligramme ($\frac{1}{1000}$ gramme). It is about equal to the $\frac{1}{60}$ of a grain. The centigramme ($\frac{1}{100}$ gramme) = 0·154 grain. The decigramme ($\frac{1}{10}$ gramme) = $1\frac{1}{2}$ grain—not generally used.

The only multiple of the gramme in ordinary use is the kilogramme (1000 grammes) = 2 lbs. 3 ozs. 120 grains, or 2·2046 lbs. or 35·31 ozs.

The terms *quintal métrique* (100 kilogrammes) and *tonneau métrique* (1000 kilogrammes) are also used in commerce. It is nearly accurate to reckon that 6 centigrammes = 1 grain; that 4 grammes = 1 drachm (60 grains); that 28 grammes = 1 oz. avoirdupois; and that $453\frac{1}{2}$ grammes = 1 lb. avoirdupois.

The standard is the popular silver piece of the country, and is always divided into 100 parts; thus in France the franc is composed of 100 centimes, whilst in Germany 100 pfennings make one mark.

Linear Measure.

Unit: The metre = 1 yard $3\frac{37}{100}$ inches, or 1·0936 yard, or 3·28 feet, or 39·3707 inches. The centimetre (cm.), or one-hundredth of a metre = 0.3937 inch. Five cm. = nearly 2 inches. The millimetre (mm.) = 0·0393 inch; m.mm. is also used in microscopy—it is $\frac{1}{1000}$ of a mm. The kilometre (1000 metres) is the only multiple used. It equals $1093\frac{1}{2}$ yards, or 0·62138 of an English mile. Eight kilometres correspond closely to 5 English miles. The square kilometre = 0·386 square mile.

The are is the standard for surface measure; it equals 100 square metres, or 119·6 square yards. The centiare ($\frac{1}{100}$) is the only division ever used. The hectare (100 ares) = 2 acres 2280 square yards, or 2·471 acres, or 11,960 square yards, and is the usual land measure.

The stère is a cubic metre, and is the standard measure for wood. Décistère ($\frac{1}{10}$ stère). Décastère (10 stères).

Scotch Trone Weight.

For Butter, Cheese, Hay, Butcher Meat, etc.

		Imperial.
16 drops	= 1 oz.	...
16 ozs.	= 1 lb.	= $22\frac{1}{2}$ ozs.
16 lbs.	= 1 stone	= $22\frac{1}{2}$ lbs.

The lb. varies from 20 to 28 ozs. in different parts of Scotland; $22\frac{1}{2}$ ozs. is the old Glasgow lb.; 22 Imperial ozs. was the number fixed by an Edinburgh jury in 1826.

Eccentricities of English Weights and Measures.—We sell pickled cod by the barrel, trawled cod at so much each, hooked cod by the score, crimped cod by the pound, shrimps by the stone, soles by the pair, Dutch smelts by the basket, and English smelts by the hundred. Butter in Ireland is sold by cask and the firkin, in England by the pound of 16 ozs., by the roll of 24 ozs., the stone and the hundredweight, which is not 100 lbs. (as in Canada and the United States) but 112 lbs. A load of straw is 1296 lbs., of old hay 2016 lbs., and of new hay 2160 lbs. A firkin of butter is 56 lbs., a firkin of soap 64 lbs., and a firkin of rasins 112 lbs. A hogshead of beer is 54 gallons, but a hogshead of wine is 63 gallons. A pipe of Marsala is 93 gallons, of Madeira 92 gallons, of Bucellas 117 gallons, of port 103 gallons, and of Teneriffe 100 gallons. A stone weight of a living man is 14 lbs., but a stone weight of a dead ox is 8 lbs.; a stone of cheese is 16 lbs., of glass 5 lbs., of hemp 32 lbs. A barrel of beef is 200 lbs., butter 224 lbs., flour 196 lbs., gunpowder 100 lbs., soft soap 256 lbs., beer 36 gallons, tar $26\frac{1}{4}$ gallons, while a barrel of herrings is 500 fish.

Proportion of Beef to the Live Weight of Oxen.

Live Weight in stones of 14 lbs. Avoirdupois.	Per cent. of Beef.			
		Class 1.	Class 2.	Class 3.
Under 180	Heifers	70 to 72	66 to 69	... ...
,, 180	Steers	69 ,, 71	66 ,, 69	... ...
From				
120 to 150	Steers	66 ,, 68	63 ,, 65	63 to 66
100 ,, 120	Heifers	66 ,, 68	63 ,, 65	63 ,, 66
100 ,, 120	Steers	62 ,, 65	60 ,, 62	57 ,, 62
90 ,, 100	Heifers	62 ,, 65	60 ,, 62	57 ,, 62
90 ,, 100	Steers	57 ,, 61	54 ,, 59	51 ,, 56
80 ,, 90	Heifers	57 ,, 61	54 ,, 59	51 ,, 56
80 ,, 90	Steers	53 ,, 56	53 ,, 56	48 ,, 50
70 ,, 80	Heifers	53 ,, 56	50 ,, 53	48 ,, 50
Under 70		... ...	... ..	45 ,, 47

Proportion of Mutton to Live Weight of Sheep.

Live Weight in Lbs.	Per cent. of Mutton.	
	In Wool.	Newly Shorn.
280 to 300	71 to 72	74 to 75
260 ,, 280	69 ,, 70	73 ,, 74
240 ,, 260	67 ,, 68	71 ,, 73
220 ,, 240	65 ,, 66	69 ,, 70
200 ,, 220	63 ,, 64	67 ,, 68
180 ,, 200	61 ,, 62	65 ,, 66
160 ,, 180	59 ,, 60	64 ,, 65
140 ,, 160	58 ,, 59	63 ,, 64
120 ,, 140	56 ,, 57	62 ,, 63
100 ,, 120	55 ,, 56	60 ,, 61
80 ,, 100	53 ,, 54	58 ,, 59
60 ,, 80	50 ,, 52	56 ,, 57

Timber Measuring.

To find the area of a board or plank.—RULE.—Multiply the length by the mean breadth of the area. NOTE.—When the board tapers, add the breadth at the two ends together, and take half the sum for the mean breadth.

To find the solid contents of squared timber.—RULE.—Multiply the mean breadth by the mean thickness, and the product by the length, for the contents.

To find the solidity of round, or unsquared timber.—RULE I.—Multiply the square of one-fourth of the mean circumference, or of the mean quarter girth, by the length, for the contents. RULE II.—Find the area corresponding to the mean quarter girth in inches, and multiply it by the length of the tree or piece of timber in feet, then will the product be the solidity in feet, and decimal parts of a foot, according to Rule I.

Seed required to Sow an Imperial Acre.

Barley	$2\frac{1}{2}$ to $3\frac{3}{4}$ bus.
Beans	2 ,, $2\frac{1}{2}$,,
Buckwheat or brank	2 ,,
Cabbage, Drumhead, to transplant	4 lbs.
Canary	8 pks.
Carrot in drills	8 to 10 lbs.
Clover	14 ,, 17 ,,
Furze or gorse, for feed	20 ,, 24 ,,
Kohl Rabi	1 lb.

Seed required to sow an Imperial Acre.—continued.

Kohl Rabi drilled	4 lbs.
,, for seed	$1\frac{1}{2}$ bus
Lucerne, broadcast	20 lbs.
Mustard, white	1 pk.
Mangold wurtzel	5 lbs.
Oats	3 to 4 bus.
Parsnip	10 lbs.
Rape or cole	1 pk.
Rye	$2\frac{1}{2}$ to 3 bus.
Rye grass	$2\frac{1}{2}$ to 3 ,,
Sainfoin giant	5 ,,
Tares, winter	$2\frac{1}{2}$,,
,, spring	2 to $2\frac{1}{2}$,,
Trifolium incarnatum	24 lbs.
Turnip	3 ,,
Wheat	$2\frac{1}{2}$ to $2\frac{3}{4}$ bus.

A Convenient Land Measure.

The following Table will be found useful in estimating the quantity of land in fields of various sizes :—

60 ft. by 726 ft. = 1 ac.		5 yds. by 968 yds. = 1 ac.
110 ,, 396 ,, = ,,		10 ,, 484 ,, = ,,
120 ,, 363 ,, = ,,		20 ,, 242 ,, = ,,
220 ,, 198 ,, = ,,		40 ,, 121 ,, = ,,
240 ,, $181\frac{1}{2}$,, = ,,		70 ,, $69\frac{1}{7}$,, = ,,
440 ,, 99 ,, = ,,		80 ,, $60\frac{1}{2}$,, = ,,

Table for Converting Feet into Links and Links into Feet.

1 link	= ·66 foot.	1 foot	= 1·5151 links.
2 links	= 1·32 feet.	2 feet	= 3·0303 ,,
3 ,,	= 1·98 ,,	3 ,,	= 4·5454 ,,
4 ,,	= 2·64 ,,	4 ,,	= 6·0606 ,,
5 ,,	= 3·3 ,,	5 ,,	= 7·5757 ,,
6 ,,	= 3·96 ,,	6 ,,	= 9·0909 ,,
7 ,,	= 4·62 ,,	7 ,,	= 10·6060 ,,
8 ,,	= 5·28 ,,	8 ,,	= 12·1212 ,,
9 ,,	= 5·94 ,,	9 ,,	= 13·6363 ,,
10 ,,	= 6·6 ,,	10 ,,	= 14·1515 ,,

Table for Converting Scottish Acres into Imperial.

Scottish.	Imperial.				Scottish.	Imperial.				Scottish.	Imperial.				Price per Scot. acre.	Equivalent per Imperial acre.		
acres	ac.	ro.	p.	yds.	acres.	ac.	ro.	p.	yds.	acres.	ac.	ro.	p.	yds.	£	£	s.	d.
1	1	1	1	24	10	12	2	17	27	100	126	0	18	28	1	0	15	$10\frac{1}{4}$
2	2	2	3	18	20	25	0	35	24	200	252	0	37	26	2	1	11	$8\frac{1}{2}$
3	3	3	5	11	30	37	3	13	21	300	378	1	16	24	3	2	7	$6\frac{3}{4}$
4	5	0	7	5	40	50	1	31	17	400	504	1	35	22	4	3	3	5
5	6	1	8	29	50	63	0	9	14	500	630	2	14	20	5	3	19	$3\frac{1}{4}$
6	7	2	10	21	60	75	2	27	11	600	756	2	33	18	6	4	15	$1\frac{3}{4}$
7	8	3	12	16	70	88	1	5	8	700	882	3	12	16	7	5	11	0
8	10	0	14	10	80	100	3	23	4	800	1008	3	31	15	8	6	6	$10\frac{1}{4}$
9	11	1	16	3	90	113	2	1	1	900	1135	0	10	13	9	7	2	$8\frac{3}{4}$

760 sq. ells = 160 falls = 4 roods = 1 Scottish acre = 1·261183 Imperial acre.

Land or Square Measure.

144 square inches	= 1 square foot.
9 square feet	= 1 square yard.
$30\frac{1}{4}$ square yards	= 1 rod, pole, or perch.
40 rods or poles	= 1 rood.
4 roods or 4840 sq. yards	= 1 acre.
640 acres	= 1 square mile.

Long Measure.

12 inches	= 1 foot.
3 feet	= 1 yard.
$5\frac{1}{2}$ yards	= 1 rod, pole, or perch.
40 poles	= 1 furlong.
8 furlongs or 1760 yards	= 1 mile.
3 miles	= 1 league.

To Estimate the Weight of a Stack of Hay.

To the height in feet of the stack to the eaves add one-half of the height from the eaves to the ridge. Multiply the result first by the length in feet, then by the width in feet, and divide the result by 27, which will give the contents of the stack in cubic feet.

A yard of new hay averages about 132 lbs. in weight, and old hay from 176 lbs. to 198 lbs.; therefore, to get the weight of the stack, the number of cubic yards must be multiplied by from 132 to 198, according to the age of the hay.

Hay and Straw.

36 lbs.	= 1 truss of straw.
60 ,,	= 1 ,, new hay.
56 ,,	= 1 ,, old hay.
36 trusses	= 1 load.

Weighing for old hay 18 cwts., for new hay 19 cwts. 32 lbs., and for straw 11 cwts. 64 lbs.

Hay sold between 1st June and 31st August is reckoned new hay; between 31st August and the succeeding 1st June, old hay.

Rule for Measuring Standing Grain.

2 ounces per square yard	=	10·08 bushels per acre.
$2\frac{1}{2}$,, ,,	=	12·60 ,, ,,
$2\frac{3}{4}$,, ,,	=	13·86 ,, ,,
3 ,, ,,	=	15·12 ,, ,,
$3\frac{1}{2}$,, ,,	=	17·65 ,, ,,
4 ,, ,,	=	20·17 ,, ,,
5 ,, ,,	=	25·21 ,, ,,
$5\frac{3}{4}$,, ,,	=	29·00 ,, ,,
6 ,, ,,	=	30·25 ,, ,,
7 ,, ,,	=	35·29 ,, ,,
8 ,, ,,	=	40·33 ,, ,,

Weights.—Men and Women. In England the average weight of men is 155 lbs., and that of women 123 lbs. Taking men the Scotch weigh more than the English, Irish, or Welsh, the figures being as follows: Scotch, 165·3 lbs.; Welsh, 158·3 lbs.; English, 155 lbs.; Irish, 154·1 lbs. For the United Kingdom the average weight is 158·2 lbs.

Weinerwusht Sausage.—see Frankfort Sausage.

Welded Pans.—The welded pan is recommended because of its cleanliness as compared with the rivetted pan, there being no bolt or rivet heads to gather dirt, etc.—see Boiling Pans.

Welsh Butter Factory.—*St Clears Farmers' Butter Factory Co., Ltd., St Clears, Carmarthen.*—The great advance which has taken place in the manufacture of butter during recent years has been due to the enterprise, to a large extent, of farmers themselves. Of course, farmers are primarily the people most interested in the manufacture of

butter, but it is not always an easy matter to get them to combine for one common interest. In recent years we have seen that farmers have, to their own great advantage, combined for many purposes throughout the United Kingdom, and in ninety-nine cases out of one hundred they have

St Clears Butter Factory.

succeeded. We have farmers' butter factories, farmers' bacon factories, farmers' agricultural supply stores, etc., etc., all conceived on the plan of co-operation. Whether the middleman—who used to flourish at the expense of the farmer—likes the change or not, history does not say, but we should be inclined to think that in any case the result is that every day we are, in so far as agricultural produce is concerned, getting into a better position to meet foreign competition.

Wales as an advanced section of the United Kingdom cannot boast of many butter factories. Butter making in the Principality seems to have been rather slow in development. It would appear, however, that there are many enterprising spirits there who recognise that they have a great good will in the reputation of the black cattle.

The Best Yearling Heifer.

St Clears Agricultural Society's Show, Sept. 7th, 1900.
Property of Mr David Evans, Dyffryn, Llanboidy
(Winner of cup for best black beast in show).

It is an undoubted fact that the breed of black cattle, which are so well known in the counties of Pembroke, Carmarthen, and Cardigan, are *facile princeps* amongst the best known for dairy purposes. A summary in the herd-book of the Welsh black cattle published at Carmarthen gives these three points as the characteristics of these animals: (1) Hardihood of constitution; (2) aptitude for dairy purposes; and (3) docility. Anyone who would judge of these qualities has only to attend the local show, and he would be surprised at the splendid-looking animals which are there exhibited.

One of the most interesting experiments that have of late years been tried in South Wales has been the formation of the company whose title appears at the head of this article—the Saint Clears Farmers' Butter Factory Co., Ltd.—who started so long ago as 1890, and whose progress since that date has been one of unvarying development and success. The idea originated with the Farmers' Club of Carmarthen, which now is known by the more resounding name of the Chamber of Agriculture. At a public meeting, held at the little village of St Clears, Mr J. Williams, who is now chairman of the company, led the meeting, and it was agreed to make the experiment of forming a butter factory in that locality. Prominent amongst those who have taken an active part in the society from its commencement also is Sir Arthur Stepney, whose large agricultural interests in South Wales cause him to take a very deep interest indeed in anything that is likely to promote the welfare of farmers. The factory at St Clears progressed so well that in 1896 it was decided to open a creamery at Laugharne, six miles from St Clears, and in the following year another branch was opened at Letterson, in Pembrokeshire. These two creameries act as feeders to the main factory at St Clears, and it is gratifying to know that the milk which is utilised is principally supplied by black Welsh cattle. The separated milk is returned to the farmers, who in turn use it for feeding calves and pigs.

Churns and Butter Worker, St Clears.

About a year ago the society determined that they would adopt, in addition to the machinery which they already possessed, a modern refrigerating plant, and consulted, with that end in view, Messrs William Douglas & Sons, Ltd., Putney, London, the well-known refrigerating engineers and dairy and butter factory experts. This firm laid down for

the society a vertical refrigerating machine, and, in addition to cooling a large space, which is used for

Laugharne Creamery.

butter mostly, the same machine is utilised for a capillary cooler, in which the separated cream is rapidly cooled, and

Letterson Creamery.

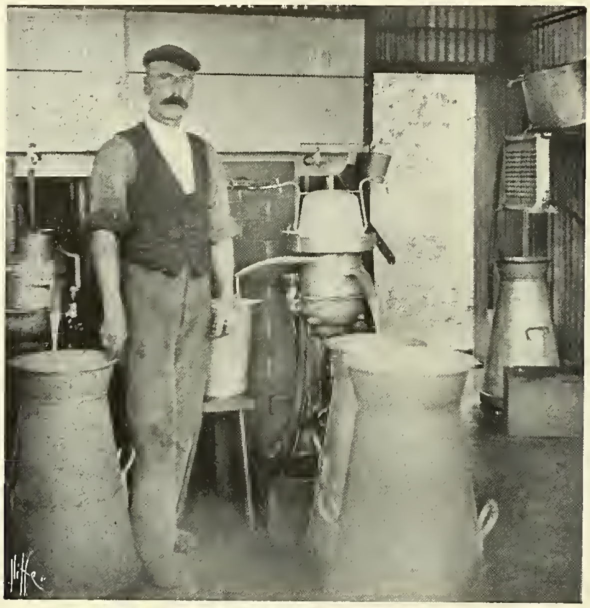
Butter Worker and Office, St Clears.

so made available at a much earlier hour than would be possible under the old conditions of cooling. The process of manufacture in butter factories is practically the same everywhere. The milk is brought into the factory by the farmer, carefully scaled and tipped into the milk receiving tank. From this it is run into a pasteurising machine, where it is heated to about 160° F. From the pasteurising machine it is then led into the mechanical separators, in which the cream and the milk are separated the one from the other by centrifugal force. The cream is led then over the capillary cooler already referred to and allowed to flow into fermenting vats, where it speedily ferments; and when "ripe" is placed in revolving churns, where it is converted into butter. The butter is then taken from the churn, and, after being dumped into lumps on side tables, is run through the butter-working machine, where the butter-milk which may exist still in the butter is pressed out by fluted rollers running on a revolving table at a slow speed. When the butter has been freed from the butter-milk it is removed and packed into such packages as may be convenient to the trade of the factory. At this point the refrigerating machine comes into use again, for the butter is only available in large quantities during the summer time, or during the season when the heat is greatest; and the butter, unless it is chilled, is very soft and oily. When the butter is put into the required packages, whether they are 1 lb., 56 lbs., or 112 lbs., it is put into the chamber and kept there for at least twelve hours in an atmosphere at a temperature of 35°. For all ordinary purposes, this

Packing Room, St Clears.

temperature is sufficient, more especially for sweet butter, which has a very quick consumption. It will be noticed, therefore, that a refrigerator in a butter factory plays a very

important part, so much so that it is difficult to conceive how a butter trade can be done, more especially at a distance from the great towns, without the assistance of



Milk Receiving Tank and Separators, Letterson Creamery

refrigerating plant. Doubtless in future it will become as necessary a part of the butter factory to have refrigerating machinery as to have a butter worker or separator.

Mr John Williams, Penlan, Llanginning, St Clears, Chairman of the St Clears Company.

Western Australia.—The Registrar General's Report gives the following information regarding the Colony:—

The number of live stock on 31st December 1899 included—

Horses	65,918
Cattle	297,075
Sheep	2,282,306
Pigs	55,953
Goats	5,987

In the same year the exports included wool to the value of £423,296, and hides and skins £82,981. There are two bacon factories and one butter factory in the Colony. The chief industry is gold mining, and pastoral pursuits take a very secondary place so far as produce is concerned.

Westphalian Bologna.—Take equal parts of fat and lean raw pork cut into small pieces the size of a hazelnut mix with 16 ozs. salt, and 4½ ozs. ground pepper. Stuff in hog casings, let them hang in an airy place for a few days, then smoke one week. They are eaten either raw, boiled, or fried.

Westphalian Sausage.—Take three parts of lean and one part of fat pork, and cut into small pieces like dice. The meat of the neck and forelegs of young pigs is best suited for this sausage. When it is all put up, season with salt, pepper, and cloves, so that it tastes mildly of the spices, and knead all together; stuff into long narrow casings, and let dry out of doors for several days, then smoke yellow.

Note.—The above sausage is made almost exactly like the "Saster" of the country people in Scotland, only in the north the smoking is omitted, and the "Sasters" are dried by hanging from a string attached to the ceiling in the kitchen. The Scotch sausages are usually kept for several months before being used.

"Whee-gee" Clip.—An apparatus for holding meat, etc., in position for cutting and slicing, and of considerable use to butchers, ham curers, hotels, restaurants, etc. It is a cleanly apparatus, takes up very little room, and does away with the necessity for clutching the meat with the left hand

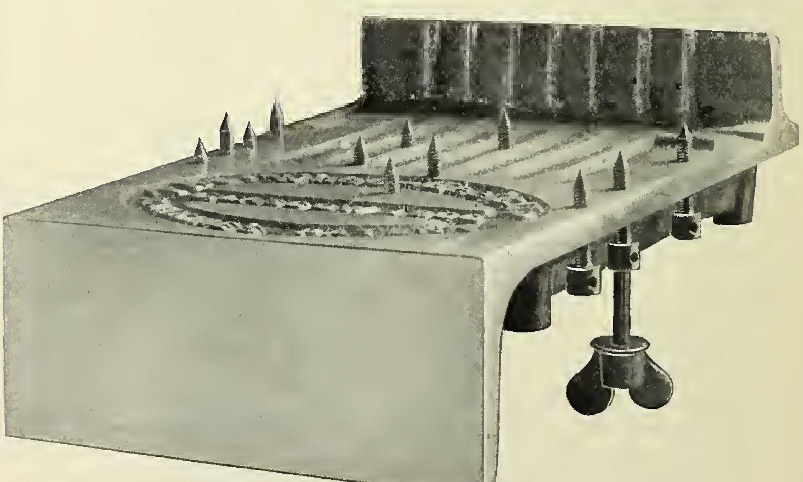


Fig. I. "Whee-Gee" Clip.

when cutting. The clip prevents the meat from wobbling and consequent ragged cuts, and it can also be used as a

bone breaker without the spluttering often caused by carrying out this operation with a hand chopper or cleaver.

The directions for use of the apparatus are as follows :—

1. All meat to be cut from right-hand side of clip.

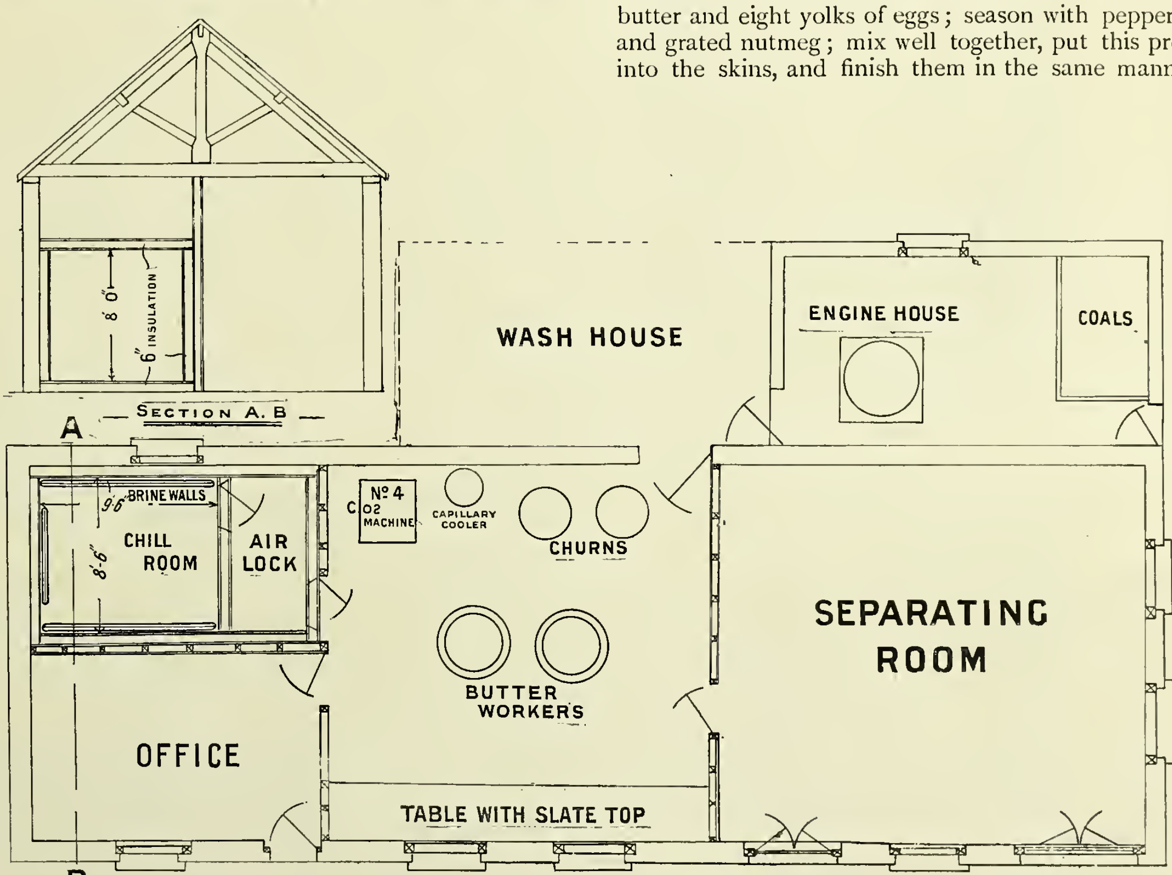
2. The slot on the right-hand side, running at an angle towards the bench, is the seat for breaking bones. Saw a notch on top where you require to break the bone, turn upside down, and the weight of cleaver falling on it will separate it.

3. For butchers.—Move all the spikes down until within ⅜ in. from surface, then it is ready for use at once.

4. For cutting gigots, smoked hams, etc.—Move up the two top spikes on right-hand side of clip, impale the meat between, as if on top of the letter "V," then begin slicing at once. If a larger area is needed, move up the spike nearest you on the right-hand side, and lower the middle one. Keep all the rest down to ⅜ in. from surface, except the four standing together on the left-hand side of clip, which are pitched in to support the shank right and left.

The three following illustrations show the clip in use for cutting beef, mutton, and ham—(see pages 396 and 397).

It will be noticed in Fig. III. that the hand lies easily on the top of the meat, while by the ordinary method of cutting without the clip the meat moves backward and forward in a radius causing a ragged cut and an unnecessary strain on the arm of the operator.



GROUND PLAN

St Clears Butter Factory.

White Pepper.—see Pepper.

White Puddings.—It seems that white puddings are one of the delicacies partaken of by royalty, and Francatelli, the famous cook, gives them as one of the dishes prepared for Her late Majesty the Queen Victoria.

Royal White Puddings.—To half a pound of the breast of a roast fowl thoroughly pounded and passed into a *purée*, add half a pint of boiled double cream, half a pound of fresh made and very fine bread crumbs; one onion chopped fine and boiled down in some white broth, four ounces of butter and eight yolks of eggs; season with pepper and salt and grated nutmeg; mix well together, put this preparation into the skins, and finish them in the same manner as the black puddings. When about to send to table, score the puddings before they are broiled, and place them on the gridiron on a sheet of oiled paper. When nicely broiled serve them dished up with either of the following sauces—*Supreme Richelieu*, *Poivrate*, essence of eschalots, of truffles, or of mushrooms.

Scotch White Puddings.

10 lbs. fine oatmeal.
7 ,, beef suet.
2¼ ozs. ground white pepper.
2 ,, fine powdered salt.

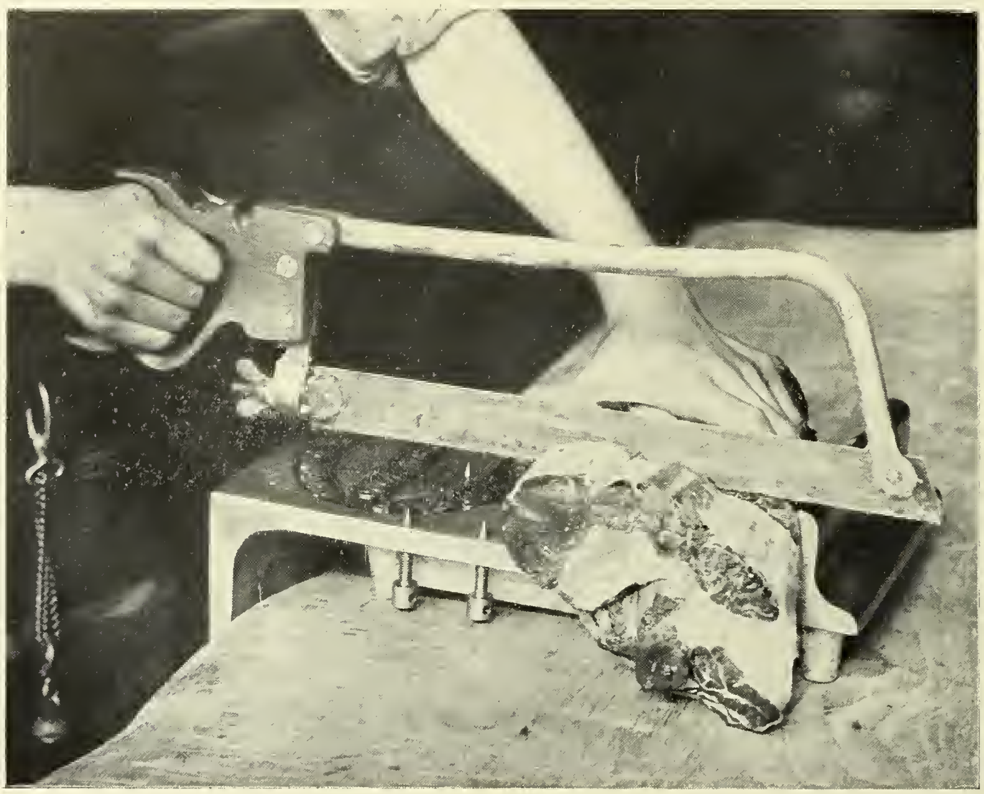


Fig. II. "Whee-Gee" in use for Beef.

Fig. IV. "Whee-Gee' Clip in use for Ham

Free the suet from all skin and stringy matter, and chop it into pieces about quarter inch square either by hand or fat-cutting machine. Mix all the ingredients together thoroughly in a basin or tub, and fill loosely into narrow "beast" runners or middle gut, pricking them to let out the air. Tie up into circular shape, and cook in boiling water for thirty minutes. They may then be hung on poles to stiffen.

Another recipé is as follows:—

10 lbs. fine oatmeal.
$7\frac{1}{2}$ „ finely-chopped suet.
$2\frac{1}{2}$ „ „ onions.
10 ozs. salt.
$2\frac{1}{2}$ „ ground black pepper.

Fig. III. "Whee-Gee" Clip in use for Mutton.

Wienawurst.—Take 18 lbs. of veal, 72 lbs. of side meat, and 10 lbs. fat pork. Chop very fine, mix well, and add 32 oz. of salt, with 7 oz. ground white pepper. Stuff in narrow hog casings; tie in links, holding $4\frac{1}{2}$ oz. each; can be cooked in three minutes.

Wienerspolse.—see Bacon Curing in Denmark.

Wiltshire Method of Rendering Lard.—see Lard Rendering as practised in Wiltshire.

Wiltshire Sausages.—To make 40 lbs. of sausages:—

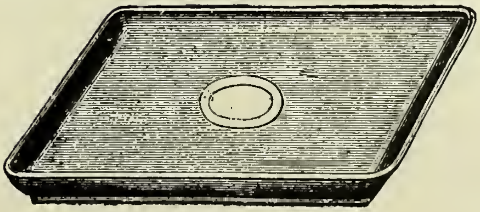
Seasoning—10 ozs. salt.
4 „ pepper.
$\frac{1}{4}$ „ dry sage.

Meat—24 lbs. lean meat.
8 „ fat „
6 „ bread.

It is best to use meat the day after it is killed. Bread may be soaked in winter, but must be squeezed well dry. Bread one day old can be used.

Window Dishes.—These may either be made of white earthenware or enamelled iron; both are very attractive, and give a tidy appearance when showing fresh sausages, mince, etc., in the windows or on the counter. The earthenware dishes are made in four stock sizes: 13″ × 9″, 15″ × 11″, 17″ × 13″, and 21″ × 17″. The enamelled iron dishes are also made in four stock sizes—12″ × 9″, 16″ × 12″, 18″ × 14″, and 22″ × 16″.

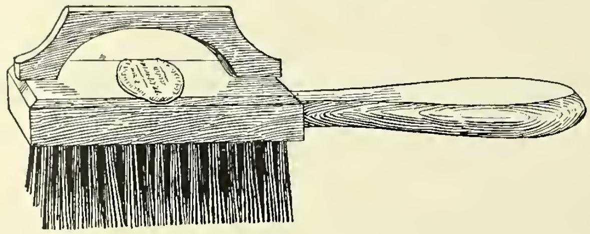
Window Fork.—A three-pronged fork made from stiff wire and plated, with a wooden handle, for lifting goods from a window. It is very useful to small goods purveyors, as it saves disturbing intervening goods where the window is arranged for show purposes (see page 398).



Earthenware Window Dish.

Enamelled Iron Window Dish.

Wire Block Brush.—A brush made from steel straps instead of hair or bristles, and used for washing and scraping butchers' blocks and cutting-up tables. They effectually



Wire Block Brush.

cleanse away all grease, etc., and—depending on the taste of the operator—may be made with a plain wood back, or have a handle with top bar, as illustrated.

Wool.—The following statement of the world's wool clip for 1899 is taken from the report of the United States Bureau of Animal Industry:—

The World's Wool Clip, 1899.—The following statement shows the estimate in pounds of the world's 1899 wool clip, made by the National Association of Wool Manufacturers. For 1898 the estimate was 2,689,614,124; in 1897, 2,652,039,191; in 1896, 2,582,103,000.

Europe:		
United Kingdom	[1] 138,312,215	
Russia and Poland	361,100,000	
France	103,610,000	
Spain	102,600,000	
Germany	49,590,000	
Austria-Hungary	64,300,000	
Italy	[1] 21,451,000	
Portugal	13,400,000	
Sweden and Norway	8,200,000	
Turkey and Balkans	67,500,000	
All other	14,000,000	
		945,063,215
North America:		
United States	[2] 272,191,330	
British provinces	12,000,000	
Mexico	5,000,000	
		289,191,330
South America:		
Argentine Republic	370,000,000	
Chile	7,500,000	
Brazil	1,500,000	
Uruguay	90,000,000	
Venezuela	15,000,000	
All other	20,000,000	
		504,000,000
Central America and West Indies		5,000,000
Asia:		
Russia	60,000,000	
British India	85,000,000	
Asiatic Turkey	39,000,000	
Central Asia	46,000,000	
China	35,000,000	
All other	15,000,000	
		280,000,000
Australasia		520,000,000
Africa:		
Algeria and Tunis	30,425,000	
Egypt	3,000,000	
Cape Colony, Natal, and Orange Free State	105,000,000	
All other	1,000,000	
		139,425,000
Oceania		50,000,000
Total		2,732,679,545

[1] Fleece washed. [2] Washed and unwashed.

The Bradford Chamber of Commerce, early in 1901, issued the following recommendations to farmers in the United Kingdom, and the points are worth noting:—

The sheep should not be allowed to run too long after washing before being clipped, as this means in effect getting the wool back into greasy condition.

Nor should they be clipped while wet, as this takes away the liveliness from the fibre and causes the wool to rot.

They should not be clipped in dirty places, such as barns littered with chaff and straw and other matters, which get into the staple and cause endless trouble and annoyance. The cost of this fault to the user is serious, as it is often impossible to get this foreign matter out without the use of chemicals.

When the fleece is wound, no clags of earth should be left on the fleece, nor put in whilst winding.

The fleeces should be tied up with bands made by twisting a portion of the fleece itself. Strings composed of vegetable matter, such as hemp, jute, etc., are bad, and ought not to be used.

Technical Wool Terms.

From Australian Journal of Agriculture.

Shafty or lofty.—Terms applied mostly to crossbred wools, meaning a plump, bulky appearance, or to deep grown wools generally.

Broken.—When the wool looks torn, will not hold together, is not fleecy. This arises from a variety of causes—poverty, old age, unripeness, or of insufficient growth.

Window Fork.—(see page 397).

Skirty.—When the wool has the appearance of being grown on the belly or skirts of the fleece. This should be taken off before the fleece is rolled.

Stumpy.—A short staple with broad top; a sign of old sheep's wool.

Kempy.—When there are short, coarse, white, or grey hairs grown amongst the fine wool—a sign of badly-bred sheep.

Stringy or roped.—Applied to scoured wool, which is much twisted or roped in the scouring.

Loose and open.—Terms applied generally to ewes and old sheep wools, signifying that the fibres of the staple do not cling together, and have not the appearance of young sheep wools.

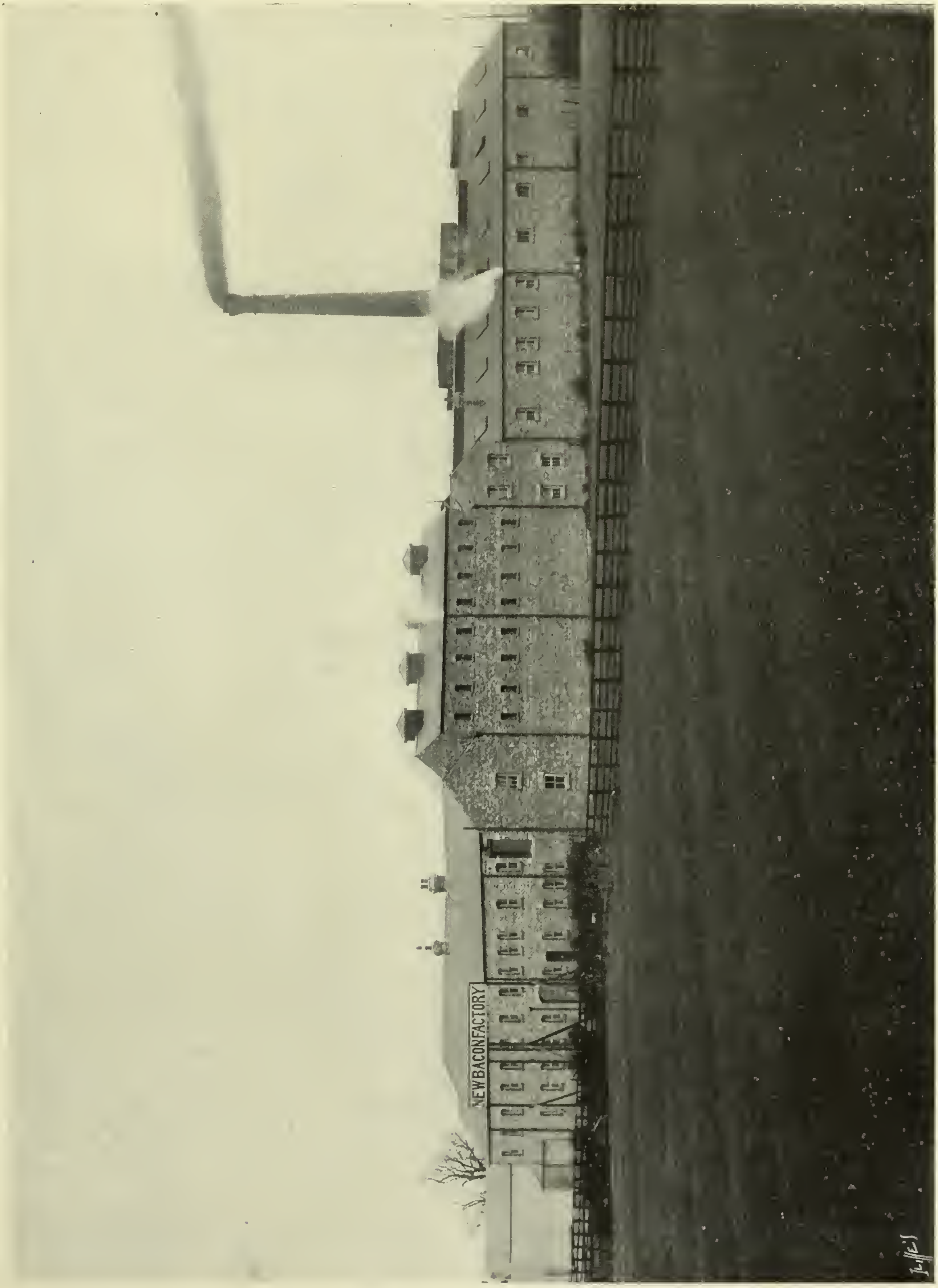
Heavy.—Signifies that the wool contains much grease or sand.

Hogget or teg.—Terms applied to the first fleece shorn off a sheep that has not been shorn as a lamb.

Lustre.—A term applied to combing wools with a rich, wavy staple of silvery and lustrous appearance, more conspicuous in wools of deeper growth.

Noity.—Applied to wools that comb badly, and waste in the process of manufacture.

Dags.—A term applied to matted or clotted soil and manure found on the britch, and sometimes the belly of fleeches.



Yorkshire Bacon Factory, Selby.

Wool in South Australia.—see South Australia.

Wool in Western Australia.—see Western Australia.

Wrapping Papers.—These may be divided into two classes—viz., inside wrappers or papers that come next to food, and outside wrappers for covering the package for transit. The inside wrapper, when used for damp oily foods, such as sausages, bacon, meat, butter, etc., should be grease proof; it should also be free from injurious chemicals, smell, or taste, and ought to be air and salt proof. The usual size of sheet in this class of wrapper is what is known as double crown, 20 ins. by 30 ins., and the most attractive colour is of a "bluey" shade; the weight per ream is about 18 lbs. for light qualities, and about 24 lbs. for heavy qualities. For parcels of 4 lbs. and upwards the heavy quality should always be used.

For the purpose of protecting the aroma of spices it is usual to line tins and kegs with "grease proof," and there are no branches of the meat or provision trades that are not large users of this paper. It is made into bags for lard when packed with a lard blocking frame, and is used for wrapping butter, margarine, and all such edible articles.

The outside wrapping paper is usually brown, and there are some thirty different varieties; the weights and sizes of sheet being endless in their number. Ordinary qualities are made from wood pulp, imported from America and Norway. Wood pulp is mostly made from white spruce, which, after being pulped, is formed into sheets of about a quarter of an inch in thickness, and is of a whitish-brown colour. It is very often mixed with rope material to give a tougher substance to the paper, The process of manufacture is rather a long one; but the principal operations are boiling the ropes, etc. (when they are used); mixing the boiled material with the wood pulp in a beating or breaking machine, where the whole is made into a liquid pulp, which in turn is conveyed to the paper-making machine, where it goes through a continuous process of agitation,—floating on to machine, draining, pressing, drying, and calendering. The printed paper comes off in rolls about 100 inches wide, which are in turn taken to the cutting machines and cut into the required sizes. When coloured wrappers are wanted, the colour is added when the material is in the liquid pulp state. The usual sizes of brown paper are:—

	Inches.
Bag Cap	$19\frac{1}{2} \times 24$.
Elephant	24×34.
Double Imperial	29×45.
Casing	36×46.
Large Casing	38×48.
Double Double Imperial	45×58.

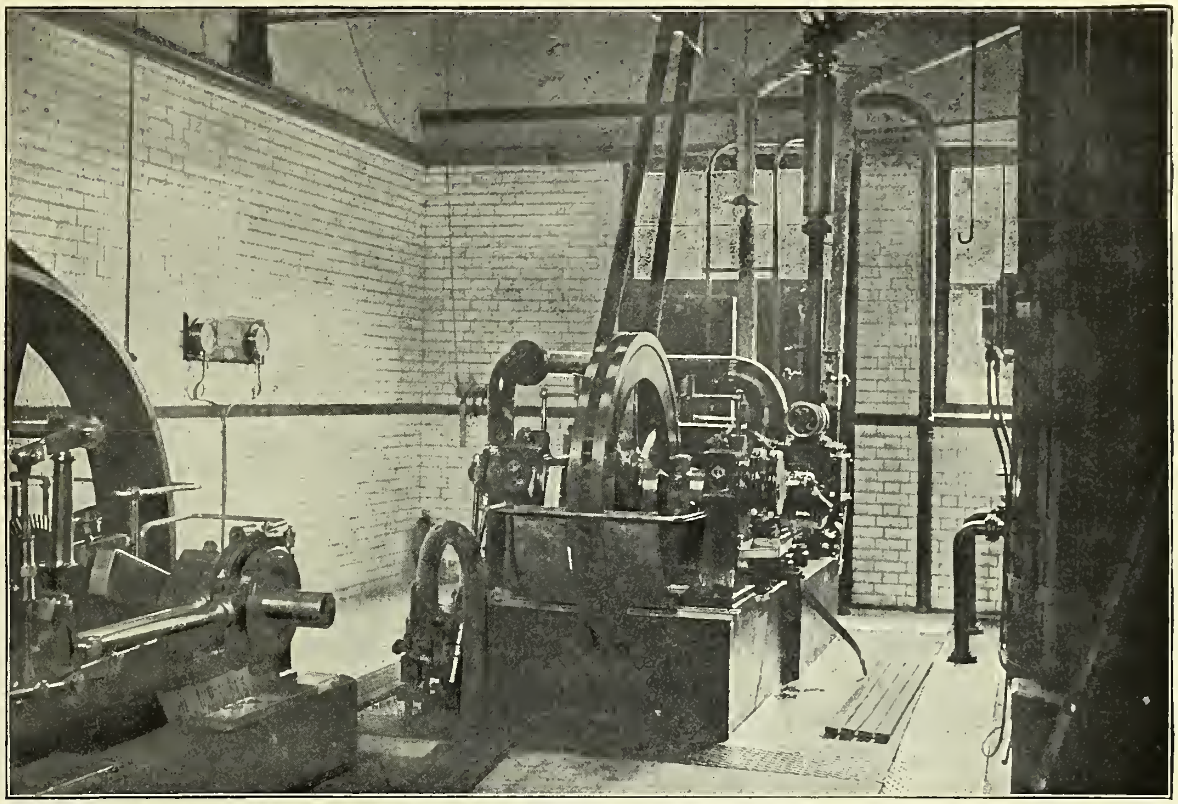
YORKSHIRE Bacon Factory.—*The Yorkshire Bacon Curing Company, Ltd., Selby.* (Written December 1899.) The town of Selby is situated in the West Riding of Yorkshire, and is well known as the junction where many of the great trunk railways of England converge. It is pleasantly situated on the right bank of the river Ouse, in the midst of a large agricultural area, for which it also forms the centre. There are only some 6000 odd inhabitants, but it occupies the centre of a vast populated area containing six millions of people. If you conceive an equilateral triangle of which the apex is York, and Leeds the angle on the left, then Selby occupies the position of the right angle.

Selby is typical of many hundreds of towns in England, inasmuch as it is the market place for the whole district around, and in that capacity becomes busy about once a week, when the farmers flock there to sell the produce of their lands. Amongst its institutions is, of course, a farmers' club. This club is progressive, if anything, and composed of Yorkshire "tykes" with a keen eye to anything likely to improve the value of their produce. Hence, it came about that when it was suggested some year and a half ago that the town seemed an ideal situation for a bacon factory, the matter was taken up with great enthusiasm, as every farmer saw prospective "Yorkshire bacon" in great quantities being distributed over England to the accompaniment of many exclamations of astonishment that no one had thought of sending it before. This is a curious fact, Yorkshire bacon and York hams are met with all over the United Kingdom, but neither York nor Yorkshire have ever known them. Some come from the far West—from the United States, some from Canada—and some from Ireland, but few, if any out of the county itself! The farming community set themselves therefore to put matters right, and led by Captain Henry Liversidge, J.P., who ultimately became chairman of the company, the idea was duly discussed, and it was agreed to go on with the undertaking. At this stage, perhaps no man took greater interest or worked harder for the proposed undertaking than the late Mr H. L. Chowan, the well-known agent of the Earl of Londesborough, and he not only succeeded in persuading his lordship to take a lively interest in the matter, but was instrumental in providing a suitable site of his lordship's land at a small cost.

The factory has been working some little time, and would be doing good work but for the fact that the Board of Agriculture have detected swine fever in a solitary unfortunate swine at Leeds, and for that reason have prescribed the whole area in which the factory is situated. That temporary aberration of the esteemed Board of Agriculture will doubtless pass, and the place get to work in real earnest.

The capacity of the place is about 1500 pigs per week, and the details of its construction are of interest as characteristic of the modern English bacon factory. There are no great packing houses in England comparable to those of the United States and Canada, but a set off to that lies in the fact that native cured meats in England bring a higher price than all comers, and about 50 per cent. greater prices than the exports for example of the United States.

The factory is designed in the form of a hollow square. The styes lie along the outside of the double walls surrounding the cellars and lead up to the slaughtering pen. There is accommodation for five hundred pigs at one time, a greater number being undesirable owing to the restrictions against keeping them more than four days. The sticking pen is fitted with a power hoist which swiftly elevates the hogs, and they are despatched and thrust into the bleeding passage, from whence they emerge and are dropped on to the dumping table of scalding tank. The leg chains by which they have been hoisted are at once removed, and they are rolled into the scalding vat, where at a sufficient



Yorkshire Bacon Factory.—Engine Room showing Duplex Refrigerating Machine.

Yorkshire Bacon Factory.—Hanging House.

temperature they are scalded so that the hair comes off easily. As soon as it becomes apparent that the hair can be easily removed they are lifted by the " cradle " on to the scuttling table, and the greater portion of the hair removed. A gob hook is then fastened into the apex of the lower jaw, and they are slid down an oblique board from the scuttling table on to the track bar, and stopped beneath the opening of the singeing stack. Through a cresset of white flame the hogs are hoisted and lowered at the rate of some two per minute if necessary, and are again dropped on to the track bar, where they are submitted to a cold douche bath while they are scraped clean. They are then disembowelled, the intestines are sent to the assorting and casing-cleaning room on the one hand, and the pigs with flake lard laid on the hook and head and feet attached are sent along the bars

circulation of brine through 4 in. cast iron pipes at 12 in. centres. A cellar should always have a certain amount of humidity, especially over the meats, hence the air must be kept pretty constant. All the chilling must be done in the chill rooms, and the meat should never leave them until it registers 38° Fahr. on the gammon end.

The cure of bacon usually extends over ten days for mild cured, and any time you like for "hard" cured. This latter bacon is warranted to create a thirst which will require much quenching!

The cure of hams is a very delicate process, and lasts about one day for each pound weight for mild cured hams, and two days for each pound weight for hams to be kept " mature " Maturing consists of keeping the hams until they develope a fine crop of blue mould.

Yorkshire Bacon Factory.—Loft of Smoke Stores where Smoked Bacon is Packed.

of the hanging house to cool. Here they hang for a few hours—four to six—according to the weather, and after being weighed they are further dissected. The head and feet are removed, and the vertebral column taken out. This leaves only sides, which are then run along the return track bar and into the chill rooms.

These chill rooms are two in number, and lie parallel to each other, with a united capacity of 13,000 cubic feet. The system of chilling is in duplicate, with circulated cold air and shallow brine walls, the object being to first remove the animal heat then allow the further complete cooling to be performed by the shallow brine walls referred to.

From the chill rooms to the cellars the entrance is direct. There are two cellars of equal size, and with a total capacity of about 25,000 cubic feet. The system of cooling is by

The temperatures maintained are 38° F. in chill rooms and 42° F. in cellars.

Practically the factory exists for ham and bacon curing, but there are other departments which have already developed amazingly, and to all appearance are likely to rank largely in the future prosperity of the concern. These are the sausage room, pie room, and bakehouse. There are, of course, lard rooms and smoke houses, also all the various auxiliary departments necessary to the complete design of such a place.

The mechanical equipment consists of two horizontal steel boilers of thirty horse-power each, to work at 100 lbs. pressure, with feed pumps in duplicate. The main engine in the engine room is a twenty-five horse-power horizontal type, non-condensing.

The refrigerating machinery consists of a carbonic anhydride duplex type refrigerating machine, and it is fitted with a compound jet condensing steam engine, air pump and feed pump. There are two compressors, each being coupled in such a manner that it can be uncoupled in a few minutes, so that either compressor can be worked by itself. The crankshaft carries, in addition to the flywheel fitted with barring gear, a pulley for driving the countershaft. From the countershaft is driven the centrifugal pump used for circulating the brine, also a Sturtevant air propeller, which is attached to an air cooler. This cooler consists of about 500 ft. run of $1\frac{1}{4}$ in. piping thoroughly insulated off and divided by a diaphragm in the centre. The air of the chill rooms is circulated over this piping and returned to the rooms. The compressors deliver into two carbonic anhydride condensers, each condenser being separate and capable of being worked independently of the other. There are two evaporators independent of each other also, and they have their own regulating valves and pipes from the condensers and the compressors. There is a centrifugal pump of large dimensions for circulating the brine throughout the system, and it is arranged to deliver into either evaporator so that either can be used independently. The fittings in the chill rooms and the cellars have already been described, but it may be useful to indicate here that much importance is attached by the engineers to insulation. The chill rooms are insulated with 7 in. of silicate cotton throughout, as is also the ceiling of the cellars. The walls of the latter are hollow, and this is deemed sufficient.

Part of the mechanical equipment consists of a one hundred light dynamo and battery of accumulators. There are a great many different machines in use in the various departments. In the lard room are the fat cutting, rendering, and cold lard filling machines, etc. In the sausage room are great power cutters and fillers, and other special machines. In the pie room are many and various appliances necessary for the production of a large number of pork pies. The smoke stoves are models of modern design, and can be regulated to a nicety both in heat and smoke. One feature of the factory also is a chemical laboratory, perhaps the first of any consequence ever equipped in England for a bacon factory.

Yorkshire Poloney Sausages.—

8 lbs. lean pork.
8 ,, fat pork.
2 ,, granulated rice (scalded).
2 ,, sausage meal.
2 ozs. food preservative (dry antiseptic).
10 ,, seasoning.

Seasoning—

9 lbs. salt.
6 ,, white pepper.
1 oz. cayenne ,,
4 ozs. nutmeg.
4 ,, mace.

Method of preparation.—Cut the pork into small pieces, and mix in the scalded rice. Chop this slightly, then add the sausage meal and what water is required. Add the other ingredients, and chop the whole very fine. Fill into weasands, cook for an hour at 200° F., and dye either with brown or poloney dye.

Notes on ingredients.—*The pork* is preferred from large pigs, as it is always firmer. *Scalded rice* is preferred to bread in many parts. In Yorkshire, however, there is no rule in the matter, bread or rice being used according to individual fancy.